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SENNA.

TO DISTINGUISH BETWEEN THE ALEXANDRIA AND INDIA VARIETIES IN POWDER, AND TO EXCLUDE POWDERED CHESTNUT LEAVES.

By L. E. Sayre,

Member of the Research Committee, of the Committee of Revision of the United States Pharmacopœia.

One of the problems presented to the members of the Research Committee is expressed by the title to this paper. The writer will endeavor to answer it as briefly as possible.

The two sennas, Alexandrian and Indian, in the powdered state, have many points of resemblance and few of diversity. In the whole state it is well known that a discrimination is readily made without the use of a lens or reagent. In the powdered state the task becomes more difficult. There are two points of difference that even a moderately acute observer will notice:

(1) The small number of plant hairs in one case and the much greater number in the other.

(2) In the dissimilarity of form of the epidermal cells. Both of these points of distinction will be referred to more at length.

(1) If equal amounts of the Alexandrian and Indian varieties in No. 60 powder be taken, it will be seen that there are about ten plant hairs of the former to one of the latter variety. If 25 milligrammes of the powdered sennas under examination be mixed with 5 c.c. of diluted alcohol, and one drop of the mixture be examined under the microscope, there will be found in the India senna from one to three of the plant hairs, and in the Alexandria variety from

eight or ten to twenty or more; the number in both cases varies of course.

On very close observation it will also be seen that the plant hairs in the Alexandrian senna have a sharp curve near the base, indicating that they are more or less appressed on the leaf, while in the Indian variety the hairs are shorter, straighter and stouter. The plant hairs almost invariably remain unbroken in the powder. Hence, from this we may reasonably expect an admixture of the two varieties in the powdered state to produce an effect recognizable

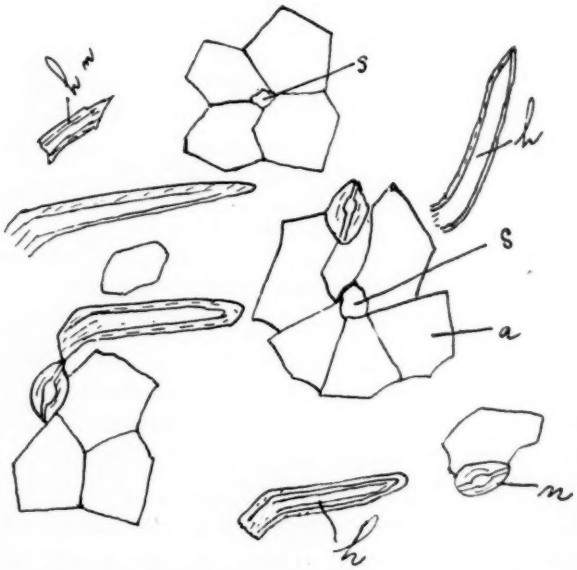


Fig. 1.—Alexandrian senna, about 260 diameters. *a*, ordinary epidermal cell; *n*, stoma; *h*, plant hairs; *hn*, broken fragment; *s*, scars.

to any one familiar with the appearance of these varieties under the microscope.

(2) Epidermal cells. The cell structure represented by the epidermal tissue seems also to be a recognizable one in the fine powder. In the Indian senna the epidermal cells are somewhat smaller and more uniform in size, and the angles more acute than in the Alexandrian variety. The second difference—epidermal cells—is not one that could be successfully employed, except by experts, perhaps, in distinguishing the powdered sennas ordinarily, or in detecting mixtures of the two.

Careful measurements of the epidermal cells in the two varieties give the following results:

India senna, average	35	micromillimetres in diameter.
Alexandria senna, average	40	" " "

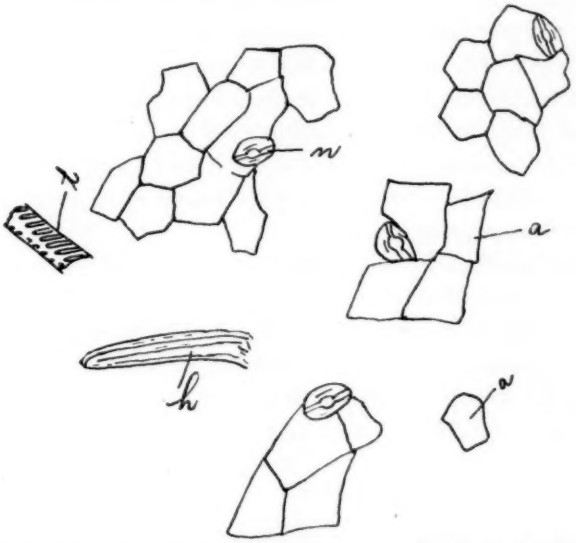


Fig. 2.—Indian senna, about 260 diameters. *a*, ordinary epidermal cell; *n*, stoma; *h*, plant hairs; *t*, tracheid (rarely found in senna).

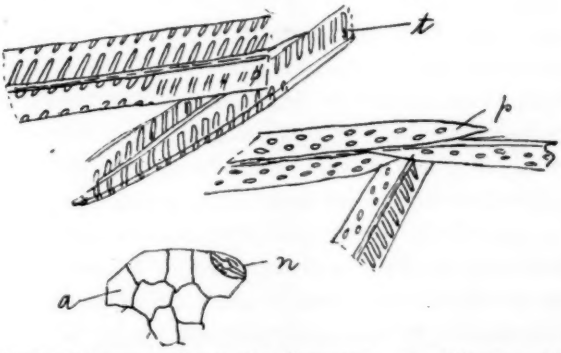


Fig. 3.—Chestnut leaves, about 260 diameters. *a*, ordinary epidermal cell; *n*, stoma; *p*, pitted cells from mid-rib; *t*, tracheids from mid-rib.

Chestnut Leaves.—The adulteration of senna with chestnut leaves in powdered form can readily be detected. Place ½ gramme of the No. 60 powder in a layer of uniform thickness on a clean glass slide,

and place this on a piece of clean white paper. Drop upon this one drop of a 5 per cent. solution of ferric chloride. The drop remains for some time in the form of a globule, unabsorbed. If senna alone be present, the powder as seen through the drop remains comparatively unchanged. If any chestnut leaves be present they will be shown by the particles under the drop in less than thirty seconds, turning a dark blue or black color (tannin). A very small per cent. of such an adulterant as chestnut leaves can thus be detected. The solution of ferric chloride should not remain on the powder more than one-half minute to give the most delicate reaction.

The epidermal cells of the chestnut leaves were found to average 25 micromillimetres in diameter.

Powdered senna, adulterated with chestnut leaves, may be examamined under a microscope and the adulteration detected by the presence of the tracheids and pitted cells which compose the midrib of the chestnut leaf. The finding of bundles of these fibres in senna powder is good evidence of adulteration. Occasionally, fragments of these wood cells may be found in senna powder, but they are rare.

A BOTANICAL EXCURSION TO MEXICO.

By John W. Harshberger.

Mexico is a profitable place for the botanist to visit, on account of the richness of the flora, numerically speaking, and because of the assemblage in one geographical region of many species peculiar to certain physical or meteorological zones. The aquatic flora, the alpine flora, the desert and tropical floras, are all found associated within a radius of a few miles. Altitude and the distribution of the rainfall explain this somewhat interesting feature of the flora. The problems presented to the botanist for solution are very intricate, and it is necessary for him, in order to solve the more difficult questions, to spend considerable time in the field, where the plants are to be found surrounded by natural conditions.

Each of the plant communities into which the flora of a country, as vast as Mexico, can be divided, can be distinguished by the component plants, which, together with their collective features, give character to the vegetation of a particular meteorological, geological or physical region of the earth's surface. Such a flora as the

Mexican can be classified into several ecological[1] communities, as follows:

(1) Hydrophytic Community, composed of Hydrophytes, or water-plants.

(2) Xerophytic Community, composed of Xerophytes, or desert-plants.

(3) Halophytic Community, composed of salt-loving plants.

(4) Mesophytic Community, including those plants found in intermediate situations, such as plants of the tropical forests, palm forests, bamboo thickets, temperate deciduous forests, sub-tropical evergreen forests, and plants of the arctic, alpine and prairie regions.

The Valley of Mexico is especially suited to ecological inquiries. It is an elevated circular valley, closed in by two distinct ranges of hills, the oldest porphyritic rocks to the north and east, which, before volcanic disturbances began, sloped gradually southward toward the Isthmus, and the newer volcanic mountains to the south and west, built up in a later period and closing off to the south and east the gradually sloping plain, thus forming the basin-shaped plateau known as the Valley of Mexico. Ajusco, the oldest volcanic peak, stands like a sentinel on the southern rim of the basin, and from its summit to the base of the valley extends a lava bed, known locally as the Pedregal. On the southeast rim of the Valley rises the ice-capped peak of Popocatepetl (17,780 feet), and to the eastward, connected with the conical volcano, the ridged back-bone of Ixtaccihuatl, also snow-capped, considered by geologists to be built of the older porphyritic rocks. Along the base of the eastern range three fresh-water lakes, Texcoco, Chalco and Xochimilcho, are found, while the partially drained basin of Lake Texcoco forms an alkaline plain, stretching along the Mexican Railroad to the hills, which jut southward into the plain at Guadalupe.

The lakes and communicating ditches furnish the hydrophytes; the alpine summits of Popocatepetl, Ixtaccihuatl and Ajusco (13,612 feet), the alpine plants; the lava beds afford a large number of xerophytes, while the alkali plain near Lake Texcoco grows a number of halophytes, which reach their greatest numerical devel-

[1] Ecology is the study of plants with reference to their environmental conditions, and covers the field of the so-called biology of plants.

opment on the Gulf Coast. The rich agricultural soil of the valley grows a varied and luxuriant series of mesophytes. It presents, in its constricted area, a veritable botanical garden, right at the doors of the population of the capital.

Space will not permit a detailed account of the plants found growing in the different vegetable zones. Only one or two plants can be taken by way of illustration. The xerophytes show very thick leaves, thick cuticle and a hairy or spiny covering, and are usually consolidated in structure. The plants are peculiarly constructed so as to store water by means of certain mucilaginous substances, which absorb moisture and hold it tenaciously, giving it off very slowly to the air. The agave, maguey, or century plant, commonly found cultivated on the plateau of Anahuac, is a typical xerophyte. It is to be seen growing wild in desert places and on lava beds, and grows in one or two forms to a large size (8 feet), weighing sometimes 600 to 800 pounds. It is a plant of considerable pharmaceutical interest. It stores up in its tissues a surprising amount of a sugary water, which exudes when the plant is tapped, as the so-called honey water, or aguamiel. This aguamiel, when fermented, yields the beverage called pulqué, which is consumed in large quantities by the poorer Mexicans, who pay *una quatrillo* (3 cents Mexican, 1½ cents American) for a glass of this yeasty-tasting alcoholic drink. It is obtained from the plant in the following way: When the agave, which yields the liquid honey-water, reaches adult size, turns slightly yellow and begins to shoot up a flower stalk, or before that time, it is tapped by hollowing out a concavity in the core of the plant at the base of the central leaves, which stand upright and are not yet fully expanded. The pulqué gatherer, with a long, hollow gourd, pierced at both ends, draws the aguamiel by suction from the concave place as it wells up from beneath. He is clad in cheap cotton clothes, and wears a hide apron fastened around his waist and a thick leather knee-pad on his left leg. Then pressing the spiny leaves aside with his left knee, he pushes one end of his gourd with his right hand into the tapped place and draws upon the other end with his mouth, until he has filled the gourd with maguey liquid. He then transfers it to a vessel made of pottery reinforced by wicker-work, or, as is the usual custom, he pours it into a vessel made of a hogskin. When his skin vessel is full, he carries it to the shed, where for thirty-six hours,

the agave juice is allowed to ferment, changing during this process from a yellowish-looking fluid to a milk-white, yeasty-looking liquid. It is a very refreshing and wholesome drink for those high altitudes if taken in moderation. Drunkenness is the result of its too free use. It is laxative, and is reputed to be antiscorbutic, and, through its assisting digestion, quiets the heart's action. The best pulqué is obtained in country places, the writer finding its use refreshing and cooling, the city pulqué being inferior to that of the suburban towns, being watery and sour. Pulqué keeps its freshness but a day, when it begins to sour. The sour liquid is distilled, and yields, according to the process used, two or three powerful alcoholic drinks, mezcal, tequila and aguardiente de maguey. There are two or three beverages or soft drinks in use, one made from the pineapple and called piño, and another, tepache, might be termed sugar-cane cider. The latter drink, as a rule, is to be had along most of the country roads running from Mexico. The mezcal, tequila and aguardiente are very powerful in their effects. A Mexican Indian, addicted to their use, can drink a glass of any one of the three without effect; two or three glasses will set him demoniacally crazy.

The alpine flora is interesting on account of the dwarf, cespitose habit of the plants, their hairy covering and brilliantly colored flowers. The plants of this region are mostly perennial, very few annual plants being found in this zone. The lake flora is interesting, as the plants are distributed in the ditches and along the borders of the lagoons and lakes. Eichornia crassipes (the water hyacinth), Marsilia heterophylla, Ruppia, Agenipea, Escobedea linearis, Polygonum amphibium, Nymphæa Mexicana, Lobelia splendens, and a water-lily with white flowers and large leaves—are a few of the plants of the hydrophytic community.

The chinampas, or floating gardens, are in Lakes Chalco and Xochimilcho. At one time they really did float, but now they are anchored to the bottom by the roots of trees, and form little patches of garden ground separated by narrow canals. Here are grown flowers and vegetables for the city market. The canoes of the Indians bring the produce to the city by the Viga Canal, where it is sold along the banks of the canal, or in the markets, the principal one of which is called the Volador, south of the National Palace and occupying a site that was included in the grounds of the "new house" of Montezuma, and, therefore, after the Conquest was a

part of the property of Cortez. Here are sold all manner of fruits and vegetables: apples, peaches, pears, pomegranates, mammees, figs, bananas, tunas, quinces, tomatoes, corn, beans and other agricultural products. The meat and poultry stalls are equally important; but it is to the sellers of herbs that a druggist would turn with most interest.

An old Indian woman, knitting or sewing, occupies a seat in an enclosed stall, surrounded on all sides by dried herbs and medicinal plants. For a small sum of money, she will prescribe for all the ailments to which flesh is heir, drawing upon her supplies of drugs hanging about the stall. These substances are compounded into medicine according to her directions, and it seems that the peons have faith in her skill, for numbers of them were observed around the stall asking medical advice. Casually, while inspecting the market, hasty notes were made of a few of the remedies which composed her stock of drugs. There were panicles of Sambucus Mexicana, dried flowers of Datura arborea, dried plants of Achillea millifolia, a few Mammillarias, tops of Datura with stems and pods, dried gourds, bunches of unknown herbs wrapped in corn-husk, bunches of the pepper tree (Schinus molle), bunches of dried roots, sea beans (Mucuna), hoofs of a deer, ears of a donkey dried, stuffed birds, carapace of a turtle, dried alligator with skin removed, armadillo skins, and other remedies too numerous to mention. I returned again and again to this market, and always found it a source of information and amusement.

Mexico is a very rich and virgin field for ecological study, and is yet an unworked field. Similar observations on other regions have been made by Dr. Eugene Warming, of the University of Copenhagen, several years ago in Venezuela, at Lagoa Santa; by Dr. Scott, who explored the Cape region of South Africa in the Kalahari desert; by Professor Stahl, in Java, and last year in Mexico, and by Dr. Trelease, of the Missouri Botanical Garden, on the Yuccas of the southwestern United States and northern Mexico.

UNIVERSITY OF PENNSYLVANIA.

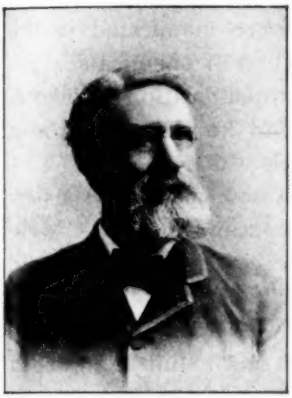
October, 1896.

Lucium is the name given to a supposed new element found by P. Barrière in monazite sand. It belongs in the cerium, lanthanum and didymium group. Atomic weight, 104.

PROFESSOR GEORGE F. H. MARKOE.

By Wilbur L. Scoville.

Perhaps the future generation will feel more eager to honor the memory of the pioneers in American pharmaceutical education than the present, and, if so, a name which is certain to increase in lustre is that which stands at the head of this article; for to none do the pharmacists, particularly of New England, owe more for present opportunities than to him, who has been well called the Father of the Massachusetts College of Pharmacy.



PROF. G. F. H. MARKOE.

Born in Valparaiso, Chili, S. A., on January 10, 1840, his early childhood was spent in that country, until, at the age of ten, he was sent to dwell with his grandparents in Salem, Mass., where he enjoyed the advantages of the public schools.

Here he made an excellent record for scholarship and proved his abilities for study; but his school opportunities were short, and, after graduating from the grammar school, he began his pharmaceutical career in the store of Mr. James Emerton. Again his studious nature showed itself in a persistent following of the course of study outlined in a syllabus of a course of study by Prof. Wm. Procter, in the *Proceedings* of the American Pharmaceutical Association of 1858. He also took up the study of botany and became well acquainted with the flora of his neighborhood. His enthusiasm for this study afterward brought him into close friendship with the late Professor Asa Gray, of Harvard.

In 1861 he came to Boston and entered the employ of Mr. Charles T. Carney, a pharmacist and chemist of exceptional ability. Here his studies were continued under wise guidance, and he became thoroughly familiar with his Mohr and Redwood's "Pharmacy," and Morfit's "Chemical Manipulations," which were his favorite books. Mr. Carney did considerable chemical manufacturing, and the apprentice had abundant opportunity to put into practice the principles which he learned in his studies.

About 1862 Mr. Markoe entered the store of Mr. Joseph T. Brown, then one of the leading pharmacists of Boston, and he remained here for eleven years, the last three years as a partner.

In 1872 a branch store was established in the Roxbury district, and in 1873 Mr. Markoe severed his connection with Mr. Brown, and became proprietor of the Roxbury store. Now his earlier studies and his broad views of pharmacy were manifested in the business which he established as a manufacturer of chemicals.

He was possessed of considerable of that qualification so necessary to a chemist—mechanical ingenuity—and he was seldom at a loss for apparatus, though his stock of utensils was not large.

He was quick to see the importance of a new method or a new chemical, and he found time to do some experimental work. He was the first in this country to manufacture chloral, which he did on a commercial scale, but found it unprofitable. He also distilled a quantity of oil of bay when that product was attracting its early attention. He had a quantity of fresh leaves sent to him from South America, which he subjected to distillation, and also made a partial analysis of the oil. His results were reported to the American Pharmaceutical Association in a paper which he presented.

At this time he was doing a considerable business in the manufacture of phosphoric acid, which he made by the old process of oxidizing phosphorus with nitric acid. This was a slow method and required close watching, and when, one morning when his stock was low, he received an order for a carboy of the acid, to be delivered within three days, he set seriously to work to devise a quicker process. All day long he studied upon the problem without success, and when he retired at night his mind was still on it. In the early morning he awoke, and the thought suddenly came to him that phosphorus pentabromide, which was easily made, could be oxidized quickly to phosphoric acid by means of nitric acid, with the formation of volatile by-products. He arose immediately and made an experimental test. This worked satisfactorily and he set about the larger quantity. At the specified time the acid ordered was ready for delivery.

The greater part of his time during the years at the Roxbury store was spent in his laboratory, and he gained a considerable reputation as an analytical and consulting chemist.

During all this time he was actively engaged in the affairs of the

Massachusetts College of Pharmacy, which he had joined in 1864. Previous to this time several attempts had been made to establish a course of study for pharmacists, and a series of lectures had been given by well-qualified men upon chemistry and pharmacy, but these had received but little support from the pharmacists. In the spring of 1867 Mr. Markoe and Mr. Lincoln, being duly authorized by the college, succeeded in drawing together a sufficient number of the drug clerks of Boston to warrant the forming of a class, and a course of nine lectures on Practical Pharmacy was given by Mr. Markoe. The interest among the clerks in this course was so marked that the college resolved to establish a permanent school of pharmacy, and the next winter lectures were given upon Practical Pharmacy, Materia Medica and Chemistry, Mr. Markoe being the lecturer on Pharmacy. His connection thus established with the school, as a teacher, was continued to the day of his death. In 1879 he was transferred to the chair of Pharmaceutical Chemistry, succeeding Professor Merrick, and in 1892 he was returned to the chair of Pharmacy, after the resignation of Professor Patch, his former successor.

In the spring of 1896 he was forced to resign this position by failing health, but his resignation was accepted only in part, he being appointed to the less arduous position of Professor of Industrial Pharmacy, in which he would, had he lived, have made his rich experience in chemical work of added value to the students by lectures upon special topics. Unhappily, he never had the opportunity of entering upon the duties of this office.

In 1870 he founded the Alumni Association, and what might almost be termed his last public appearance was at the twenty-fifth anniversary of this association, on May 21, 1895. He was decidedly the most prominent figure at this gathering, and it resolved itself largely into a dinner in his honor.

As a teacher he was enthusiastic and sympathetic. His lectures abounded in information of a practical nature, drawn from his own experiences, and many a student has thanked him repeatedly for "a pointer" in his manipulations.

He took a very broad view of pharmacy, and was identified with many societies belonging to the allied sciences. He joined the American Pharmaceutical Association in 1863, and served as its President in 1875–76. He was also an active member of the Boston

Scientific Society, the Horticultural Society, the Society of Arts, the Society for the Advancement of Science, Massachusetts Pharmaceutical Association, Boston Druggists' Association, etc.

He lectured frequently before some of these, and presented many papers to others. Indeed, his literary work was confined almost entirely to papers which he prepared for the scientific societies of which he was a member. The *Proceedings* of the A. Ph. A. contain many of these.

In 1872 he attended the meetings of the British Pharmaceutical Conference in England, and, upon motion of the late Daniel Hanbury, was elected an honorary member of that body. His visit was most auspicious and he made many valued friends across the water. In 1878 he again visited England, and the cordiality with which he was received was among the pleasantest memories of his life.

His honorary membership in the Royal Pharmaceutical Society of Brussels and several of the pharmaceutical schools and societies of the United States bespeaks the esteem with which he was held here as well as abroad.

In 1891 Dartmouth College conferred upon him the honorary degree of Master of Arts. He has been a member of the Committee of Revision of the U. S. Pharmacopœia for nearly three decades, having been actively engaged in the revisions of 1870, 1880 and 1890. His death makes the second vacancy in that committee within a year.

He served as instructor at the Harvard Medical School from 1872 to 1879.

In 1890 he retired from the retail store in Roxbury and accepted a position with the Burnett Company, of Boston, as managing chemist. Much of his time here was occupied in originating and perfecting new products, and during the few years that he was with them he saw a line of color pastes, smelling salts and toilet perfumes, all of his own devising, successfully launched upon the market.

It was on the floor of his private laboratory at the Burnett Building that he expired suddenly, some time during the late afternoon or the evening of Thursday, September 24th. Apoplexy was the immediate cause of his death, and a sudden end was expected by those who understood his condition.

Professor Markoe was twice married. In 1866 he was united to

Miss Ellen G. Jenners, and one son, George B. Markoe, now in Colorado Springs, Col., was the fruit of this union. Mrs. Markoe died in 1879, after a lingering illness, and in 1881 he was again married, this time to an English lady, Miss Louise E. Moore.

His widow and a daughter, born in 1893, survive him.

Undoubtedly, Professor Markoe possessed the qualifications for a great leader, but was handicapped by the meagreness of his early education. In spite of this, he lived to see a struggling college, which he was the immediate means of starting, grow into a strong and influential institution, and himself publicly honored for his scholarship.

He could not help feeling that in the changes of the past twenty-five years he had no small part, and he derived a genuine, albeit a modest, satisfaction therefrom. His life is a worthy example for the youth of small opportunities, and should be an incentive to redoubled efforts for the strengthening of the ideal in pharmacy.

ANTIMONII OXIDUM AND PULVIS ANTIMONIALIS.

By Charles H. LaWall.

Antimony trioxide, *Antimonii Oxidum*, U. S. P., 1890, was admitted to the Pharmacopœia of the United States in 1860, at which time it was included in the secondary list, comprising the preparations, as a process was given for its manufacture. The edition of 1870, of the same work, retained it in the same class; but in the revision of 1880, at which time the distinction between primary and secondary classes was abandoned, it was included among the compounds of antimony, the process for preparing it being omitted. The present edition made no further change.

The commercial article is used in the arts as a pigment, but has never occupied an important position in medicine, and few retail pharmacies even have it in stock. It enters into the composition of antimonial or James' powder, *Pulvis Antimonialis*, U. S. P., and, in the earlier editions of the Pharmacopœia, it was used in the preparation of tartar emetic. The manufacture of this compound has long since been discontinued by retail pharmacists, the present tendency of pharmacy, regarding chemicals, being more toward analytical than manufacturing work.

Pulvis antimonialis, however, is a preparation requiring very little time or trouble to make, and should be made in every well-conducted establishment. According to the present United States and British Pharmacopœias, it consists of 33 per cent. of antimonous oxide and 67 per cent. of calcium phosphate. The original formula, which was used by a Dr. James, of England, in the early part of the last century, was very crude, and yielded a preparation of varying composition and correspondingly uncertain physiological action. This method was adopted by several of the earlier European Pharmacopœias, and consisted in calcining a mixture of certain proportions of horn shavings and black sulphide of antimony. The uncertainty of the composition of Calcaria phosphorico-stibiata, as it was sometimes called, led to the adoption of various processes ensuring a more uniform product. One of these processes was that of the Dublin Pharmacopœia of 1850. This directed that a solution of tartar emetic should be mixed with a solution of sodium phosphate, after which a solution of calcium chloride and ammonia water were to be added; this caused the precipitation of antimonous oxide and calcium phosphate intimately mixed. The same object is attained by the present process, which consists in thoroughly mixing the precipitated calcium phosphate and antimonous oxide. Several compounds resembling antimonial powder, from the fact that their medicinal efficacy depends upon the presence of antimonous oxide, have been in use in various countries; one of these is Pulvis resolvens, which is composed of 2 parts of potassium sulphate, 1 part of potassium nitrate and 1 part of antimonous oxide; another, called Tyson's antimonial powder, is a much milder form. It contains 2 parts of antimonous oxide and 18 parts of calcium phosphate.

Several oxides of antimony are known. The trioxide or antimonous oxide, Sb_2O_3, exists in nature principally as valentinite and senarmontite. It is prepared artificially by several methods, which are given in the leading chemical text-books. Its presence is established in a mixture of the different oxides by the black precipitate of argentous oxide which is produced when solution of silver nitrate is added to a solution of the oxide in potassium hydrate; the addition of ammonia water dissolves the precipitate caused by the higher oxides or the antimonates, but does not dissolve the argentous oxide.

The pentoxide or antimonic oxide, Sb_2O_5, does not exist in nature, but is prepared artificially. It is easily distinguished from the trioxide by the liberation of iodine, which takes place when potassium iodide is added to a solution of the oxide in hydrochloric acid.

The so-called tetroxide, Sb_2O_4, considered by some authors as antimonous antimonate $Sb_2(SbO_4)_2$, or antimonyl antimonate, $(SbO)SbO_3$, is obtained when either of the other oxides is ignited with access of air. It acts in some respects as a compound containing both Sb_2O_3 and Sb_2O_5; but while it liberates iodine from potassium iodide like the pentoxide, it does not resemble the trioxide by precipitating argentous oxide. Several hydrated compounds of these oxides are known, their formation depending upon the method of precipitation and the temperature at which the precipitate is dried.

Three different methods were used for the estimation of the antimony in the samples of oxide examined by the writer. No. 1 was based upon the following equation: $4I + Sb_2O_3 + 2H_2O = 4HI + Sb_2O_5$. This method served for the estimation of the antimonous oxide. The details of the process are as follows: a weighed quantity of the oxide (about 0·2 gm.) is warmed with an excess of tartaric acid solution for about fifteen minutes; the excess of acid is then neutralized with sodium carbonate, and a saturated solution of sodium bicarbonate in water is added, in the proportion of about 20 cubic centimetres to each 0·1 gm. of Sb_2O_3 taken. The liquid is then titrated with decinormal iodine solution, using starch paste as an indicator. The percentage of antimony is easily calculated from the amount of iodine solution used, each cubic centimetre of the latter corresponding to ·006 gramme Sb.

Method No. 2 depended upon the reducing action of hydriodic acid upon antimonic compounds, $SbCl_5 + 5KI = SbI_3 + 2I + 5KCl$, hydrochloric acid being present in the solution. It was used for estimating the total amount of Sb present by first heating the sample in a beaker with HCl and $KClO_3$, whereby antimonous compounds are oxidized to antimonic. The chlorine is then driven off by heating in a water-bath, the liquid is cooled and potassium iodide is added in excess. The iodine liberated is estimated by titration with decinormal sodium thiosulphate solution, the results being calculated in the same manner as those in the previous case.

The third method consisted in igniting Sb_2O_5 to form Sb_2O_4, which is then weighed and the per cent. of Sb calculated. To a weighed portion of the oxide in a porcelain crucible fuming nitric acid is added and carefully driven off by applying gentle heat; this oxidizes the slightly volatile antimonous oxide. The crucible is then heated to redness until a constant weight is reached. 100 parts of Sb_2O_4 represent 78·94 parts of Sb, or 94·73 parts of Sb_2O_3.

Six samples were examined, using all three of the methods of estimation upon each specimen. The first and third samples were made from a solution of antimony terchloride, which had been prepared by the action of nitro-hydrochloric acid upon metallic antimony. This solution, which was not made by the writer, contained antimonic chloride, indicated by appropriate tests; it had a specific gravity of 1·515; the percentage of antimony, determined by method No. 1, was 5·92, corresponding to 11·13 per cent. $SbCl_3$; the percentage by method No. 2 was 6·28, corresponding to 15·00 per cent. $SbCl_5$. The samples of oxide obtained by the decomposition of this solution consisted of a mixture of the two oxides, the variation in proportion being, doubtless, in the hydration of the higher oxide.

The second sample was obtained in the market; but, after finding that it consisted entirely of the higher oxide, inquiry was made, which developed the fact that it was stibic acid and not the official oxide.

Sample No. 4 was made by the writer, using the process of the 1870 Pharmacopœia. It shows the reliability of that process for manufacturing a U.S.P. product.

Sample No. 5 was obtained in the market, in an original package bearing the label of a well-known chemical manufacturing firm. This sample was also of good quality.

Sample No. 6 was a commercial article from another large manufacturing house, and was of fair quality except in appearance, which was very unfavorable.

Samples Nos. 4 and 5, being the only specimens which answered the requirements for appearance and solubility, were further examined for chlorides, sulphates and metallic impurities. They complied with the U.S.P. requirements in every particular.

The results of the examinations are appended in tabular form for the purpose of ready comparison.

No. of Sample.	Estimated Sb by Method No. 1.	Sb by Method No. 2.	Sb by Method No. 3.	Remarks.
1	26·70	69·12	70·23	
2	—	58·43	68·29	Labeled stibic acid.
3	48·00	70·92	71·27	
4	82·68	82·40	82·91	U.S.P. in every respect.
5	81·84	80·40	82·55	U.S.P. in every respect.
6	71·05	78·34	81·61	For use in the arts.

The per cent. of Sb_2O_3 in the different samples, calculated from the amount of Sb estimated by process No. 1, is as follows:

Sample No. 1, 32·04 per cent.; sample No. 2, not estimated; sample No. 3, 57·60 per cent.; sample No. 4, 99·21 per cent.; sample No. 5, 98·21 per cent.; sample No. 6, 85·26 per cent.

An attempt was made to estimate the Sb in the Sb_2O_4 obtained by the ignition method, using the other two processes, but no satisfactory results could be obtained.

305 CHERRY STREET, PHILADELPHIA, PA.

THE TANNIN OF SOME ACORNS.

BY HENRY TRIMBLE.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 159.

Having been repeatedly questioned concerning the astringent value of acorns, I determined this year to make some tests of them from a few species of oaks. The season just passed has been one in which the oaks of this vicinity fruited abundantly. In a good season the chestnut oak, Quercus prinus, probably yields the greatest amount of fruit, as the acorns are very large; the white oak, Q. alba, however, bears very abundantly, as shown in the accompanying illustration, *Fig. 1*. A tree covered with fruit is a conspicuous object about the first of September, and until the acorns fall a month later.

Fig. 1.—Branch of White Oak in fruit.

In order to refresh the memory of the reader, a sectional illustration of a chestnut oak acorn is shown in *Fig. 2*.

The several parts of the chestnut oak acorns were assayed for tannin, commencing September first, when they had reached their full size, and continued at intervals until the first of October, when they had fallen. The acorns of this species were taken for investigation because of their large size and abundance, also because they are the fruit of the species of oak whose bark is the most highly prized for its tanning value.

The estimations of tannin were made as soon after the collection of the fruit as possible. It was necessary, therefore, to determine the moisture, and make a calculation of the amount of tannin in the

Fig. 2.—Section of Acorn. *c*, cupule; *p*, pericarp; *t*, testa; *e*, embryo; *ct*, cotyledon.

absolutely dry substance, so that in the following results the tannin and ash are both based on the absolutely dry substance:

ACORNS OF QUERCUS PRINUS, L.

Part Estimated.	Date of Collection.	Moisture.	Ash in Dry Substance.	Tannin in Dry Substance.
Cupule	August 29	50·56	1·73	18·20
Cupule	September 20	14·24	1·49	19·00
Cupule	October 4	11·76	1·32	13·37
Pericarp	August 29	13·57	1·66	15·96
Testa	August 29	11·65	1·94	42·10
Testa	September 20	11·01	2·62	48·09
Cotyledons	August 29	34·90	1·07	8·75

It will be seen from these figures that the testa is exceedingly rich in tannin, but the small amount of this coating in each acorn and the difficulty of separating it preclude the possibility of it becoming a profitable source of that compound.

The cupule usually attracts attention on account of its astringency, and it will be observed that when it is collected during September it is valuable; but the difficulty of collection from the trees would be an industrial drawback, and after it falls the deterioration is considerable, as shown in that collected on October 4th, which collection was from those which had fallen to the ground.

A quantity of the tannin was extracted from the cupules of the chestnut oak, and purified. It resembled, in physical and chemical characters, that of all the oak barks heretofore examined by me, by giving a green color and precipitate with salts of iron, a precipitate with bromine water, and a pink color with calcium hydrate. On combustion it yielded the following percentages, which are compared with the average composition of the tannins obtained by me from nine species of oak bark:

	Tannin from Cupules of Chestnut Oak.	Average Obtained on the Tannins from Nine Species of Oak Bark.
Carbon	59·93	59·79
Hydrogen	5·76	5·08
Oxygen	34·31	35·13
	100·00	100·00

The following are the percentages of tannin found in the cupules of a number of other oak species:

	Date of Collection.	Moisture.	Ash in Dry Substance.	Tannin in Dry Substance.
Quercus alba, L.	Aug. 29	40·85	2·24	11·75
Quercus macrocarpa, Michx.,	Aug. 31	56·14	5·59	10·37
Quercus rubra, L.	Aug. 30	28·86	2·77	5·27
	Oct. 4	7·66	2·76	4·55
Quercus velutina, Lam.	Aug. 30	13·85	3·16	7·77
Quercus coccinea, Wang.	Aug. 29	21·03	1·99	12·66
Quercus digitata, Marsh.	Oct. 18	46·52	4·34	5·98

I am indebted to J. C. Peacock for the preparation, purification and ultimate analyses of the tannin from the cupules of the chestnut oak; and to G. H. Maghee for the estimation of the tannin in the cotyledons of chestnut oak, and for repeating my estimations in a number of other cases, thereby confirming them. The hide-powder process was used in all the estimations.

A HISTORY OF THE PHARMACEUTICAL MEETINGS OF THE PHILADELPHIA COLLEGE OF PHARMACY.

By Thomas S. Wiegand.

As this is the first of the pharmaceutical meetings for the series of 1896–97, it was thought that a historical sketch of their inception and some of the subjects that had been brought before the College at these meetings would be interesting, especially to the younger members of the College and such of our classes as might be present.

In the College minute book for 1841, under date of December 27th, it is noted that the following-named persons: Wm. R. Fisher, Charles Ellis, Wm. Procter, Jr., Samuel F. Troth, Jos. C. Turnpenny, Ambrose Smith and John H. Ecky, addressed a communication to the College, asking that they, and such others as would associate themselves with them, be granted the use of the hall and library to conduct discussions, institute scientific investigation and report upon matters of interest to pharmacists, basing their request upon the advantage and interest which had accrued from meetings of similar character, held in the Paris Society of Pharmacy, and in the lately established Pharmaceutic Society of Great Britain.

It was determined not to introduce the ordinary business affairs of the College or trade into these meetings.

In response to this proposition, the College gave its sanction to the application, and directed that these meetings be known as the "*Pharmaceutic Meetings* of the Philadelphia College of Pharmacy."

As we rehearse the names of those who made the application, how much of local professional pride is stirred when we remember how well these men, each and every one of them, bore their part in the ordinary work of the College, as well as in bringing forward matters of scientific interest to help the then struggling pharmacists to do better and more accurate work in their chosen calling.

The first action, arranging methods for conducting these meetings, was taken June 26, 1842. The time, the reading of the minutes, correcting them, if necessary, and adopting them, introduction of strangers, donations to library and cabinet, reports of committees, written and verbal communications, miscellaneous business and conversation, was the plan mapped out, and it will be seen how well the originators of the meetings comprehended the needs of the

occasion, for they have proven useful to the present time, almost exactly as when first adopted.

The essays then presented were referred to a committee for examination, who were expected to report at the following meeting, unless otherwise ordered; the strangers who were introduced were entitled to participate in the scientific discussions.

At a meeting of the College, held September 27, 1842, an amendment to the by-laws directed that the pharmaceutical meetings should be limited exclusively to scientific subjects, and the committee, on motion of Samuel F. Troth, were directed to notify the members of the College, by circular, of the meetings, and invite their attendance and co-operation.

From 1844 to 1850 the meetings seem to have been held, but few notices of their proceedings have been found, either in the minute book of the College or the JOURNAL OF PHARMACY.

In the year 1856 the members were notified that the meetings were held on the first Monday of every month, from October to May, inclusive. We find notices that the Library received quite a large number of books, and that valuable additions to the Cabinet had also been received: four papers upon chemical subjects, two upon materia medica and five upon pharmaceutical matters—thus showing that matters of practical and every-day interest had their full share of attention. Notwithstanding all this, the meetings fell off in interest, and were for some time discontinued.

In 1870 the meetings were resumed, after an interruption of some ten years. Dr. Pile, Israel J. Grahame and Prof. Maisch were requested to bring forward an order of business for them, which was done, and a standing committee of three were appointed to bring forward subjects of interest to the attention of the meetings.

At the first one, Prof. Maisch called attention to the difference between a species of gum known as gum sennaar and that derived from the Acacia vera. The committee reported that members of the College, and all others who may desire to participate in the proceedings, be earnestly invited to attend and bring forward either written or oral contributions upon subjects germane to the sciences we are interested in; that the presiding officer of the meeting call for discussions upon the subjects under consideration; that a standing committee bring forward such subjects as may be of interest, in addition to what may be brought up by the members.

The members were invited to propose queries upon subjects in which they felt interested, which queries might be answered at once or referred to a future meeting.

Dr. Bridges, at this meeting (November, 1870), described the process of etching on glass by means of the sand blast, and thought it would likely supersede much of the engraving upon glass. He also explained the discovery and the principle of the spectroscope and the wonderful revelations thus far made by it, and the prospect that is opened up for discoveries even more wonderful than those yet made known. An exhibition of the instrument was then given by Prof. Bridges, assisted by Mr. Bullock.

At the December meeting, Dr. Pile explained and illustrated rules for changing the strength of strong alcohol to proof spirit, to reduce alcohol to any required strength, or to make any required quantity of any of the above-mentioned liquids.

Dr. Pile also called attention to a prescription, the use of which had resulted fatally. The prescription is as follows:

℞ Strychniæ Murias, gr. iss.
Syrupi Ferri Iodidi, f℥ vi.
Syrupi Zingiberis, q. s. ft. f℥ iii.
Misce. Sig.—Teaspoonful three times a day.

The Doctor stated that he had compounded the prescription, carefully dissolving the muriate of strychnia, and had kept it several months, without sign of precipitation. He thought that if the alkaloid was added without being dissolved, the last dose would contain nearly all the strychnia, and hence the fatal results.

An examination of the subjects reported to the different meetings shows that over 500 different papers have been reported on, and many of these were of the greatest advantage to a large number of those who were listeners at these meetings. This should be a strong incentive to every attendant to bring up for discussion any subject that may interest or even perplex him in the daily round of shop work.

Iodide of Starch in Surgery.—Majewski (*Wiener med. Presse*, 1896, No. 19; *Centralblatt für Chirurgie*, August 1, 1896) recommends iodide of starch as an excellent application in suppurating and neglected wounds, phlegmons, panaritia and venereal sores. A mixture of 1 part of tincture of iodine and 2 parts of starch, he says, exceeds iodoform in antiseptic action and in controlling suppuration. It is exceedingly hygroscopic, almost odorless and very agreeable.—*New York Medical Journal.*

ABSTRACTS FROM THESES.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 160.

ESTIMATION OF AMMONIUM CHLORIDE IN TABLETS.

Albert B. Johnson, Ph.G., made experiments with the view of devising a process for the estimation of ammonium chloride in the compressed tablets of this substance, and such organic matters as licorice, etc. The following processes were found to give practically concordant results. For the ammonia: powder a few of the tablets, weigh a portion of the powder: place it in a flask, add water; make the mixture alkaline with sodium or potassium hydrate solution; connect the flask with a condenser provided with a receiving flask containing a measured volume of decinormal oxalic acid volumetric solution to absorb the ammonia, and distil until two-thirds of the volume in the first flask has passed over. Then titrate the excess of acid in the receiving flask with decinormal potassium hydrate volumetric solution, using rosalic acid as indicator. Calculate the amount of ammonia found into ammonium chloride, and this by proportion to the weight of powdered tablets taken into percentage. For the chlorine: take another weighed portion of the powdered tablets, mix it well in a mortar or other vessel, with four or five times its bulk of chlorine-free calcium carbonate, introduce the mixture into a tube of hard glass, closed at one end, and previously charged with a layer of unmixed calcium carbonate; rinse the mixing vessel with several small portions of carbonate, transferring each in succession to the tube, and follow these with a layer of plain carbonate. Heat the tube to low redness by means of a Bunsen burner (or combustion furnace), beginning at the end of the charge next the open end, and gradually extending the heat toward the closed end until all the carbonaceous matter is consumed, which is indicated by the disappearance of charred matter. Allow the tube to cool somewhat, then break it by carefully blowing on it a a few drops of water from wash bottle; add water to the broken mass, then nitric acid until effervescence ceases, warm gently, filter to remove fragments of glass, and completely precipitate the filtrate with silver nitrate, boiling to coagulate the precipitate. Collect the precipitate on balanced filters, wash and dry at 130° C. to a constant weight. Calculate the silver chloride into ammonium chlor-

ide, then the percentage of this ingredient by proportion to the weight of powdered tablets taken.

The small amount of ammonia in the licorice was disregarded. If the ammonia and chlorine exist in the tablets only as ammonium chloride, it is obvious that the results of the foregoing operations should be identical. Of course, if it is desired to ascertain the number of grains of ammonium chloride in each tablet, the number of tablets taken should be noted, the tablets then weighed, afterwards powdered and an aliquot part of the powder taken for each analysis, so that the answer may be obtained by dividing the number of grains equal to the grammes of ammonium chloride found by the number of tablets represented by the aliquot part used.

ASSAY OF FLUID EXTRACT OF COCA.

Kingsley C. T. Schneider, Ph.G., assayed eight fluid extracts of coca. After some preliminary experiments it was found that Lloyd's process gave the best results of the several methods tried. The green coloring matter was separated by dissolving the crude alkaloid in acidulated water and filtering; the alkaloid was thereafter extracted by making alkaline with ammonia water and shaking with chloroform, which, upon evaporation, left the alkaloid. To preserve the accuracy of the process 10 c.c. of the fluid extract were used for each assay. The following results were obtained: 0·535, 0·485, 0·675, 0·655, 0·625, 0·370, 0·335 and 0·675 per cent. These figures indicate the difference in the strengths of this preparation as found in the market of the United States.

ASSAY OF TINCTURE OF NUX VOMICA.

Olive C. Johnson, Ph.G., assayed sixteen samples of this preparation by the official method. Five of these were from manufacturing houses and eleven from retail druggists in Philadelphia. The former of these showed, respectively, 0·33, 0·31, 0·31, 0·27 and 0·24 per cent. of total alkaloids. Of the eleven samples from retail stores, one was made by the 1870 United States Pharmacopœia formula; it contained a large amount of oil and only 0·16 per cent. of alkaloids; three were made by the 1880 United States Pharmacopœia method; they contained oil and resin; their strengths ranged from 0·20 to 0·30 per cent. of alkaloids. One was made from a concentrated preparation of a manufacturer; it was practically free from

resin and oil, and contained 0·28 per cent. of alkaloids. The remaining six samples were prepared according to the directions of the 1890 Pharmacopœia, they were almost free from oil and resin. The greatest amount of alkaloids present was 0·31 per cent., while the least amount found was 0·25 per cent.

EXAMINATION OF TINCTURE OF IODINE.

Leon K. Baldauf, Ph.G., on account of the change made in the strength of this tincture in the last revision of the Pharmacopœia, assayed twenty samples in order to ascertain the quality of the article as dispensed. The official method of estimation was employed. In most cases a wide departure from the official strength of 7 per cent. was found; one sample contained but one-half the required amount. Two of the samples were stronger than necessary. The average strength was 5·79 per cent.

A RÉSUMÉ OF RECURRENT TOPICS.

By William B. Thompson.

Sponge.—The consumption of sponges appears to be largely in favor of the American market, from three to four times the weight shipped to Great Britain, France and Holland united, being assigned to the United States. This may be due to some extent to the fact that the principal fisheries lie nearest to our coasts. The modification by warmth of the Gulf Stream, likewise the eastern Mediterranean, may have an important operating influence on sponge growth. This is a fact worth ascertaining. This may be said of the Americans, which cannot be said of all other nations, that the virtue and luxury of cleanliness is highly esteemed among us as a people, and as a means to sanitation and as an adjunct to the bath, the sponge is both grateful and useful. Our increasing consumption is, therefore, due to our appreciation, not our needs. It goes as an accompaniment to refinement and a higher civilization. It is an interesting fact in the history of sponge that a certain curative effect, when externally applied, led to an investigation and the discovery of that important elementary substance, iodine, as one of its constituents. Therapeutically, the carbonaceous residue of charred sponge offers not only an antiseptic property, but it should afford, through its contained salts, an effective resolvent for glandular

enlargement and other manifestations of strumous diathesis. Commercially considered, sponge is one of the apothecary's chief staples, an exhaustless object of display by pyramid and festoon. In those frequent domestic calamities of *spilled milk* and *ink*, sponge is the first aid and hope to the distracted. The preparation of curing and bleaching of sponges by art appears to be chiefly a foreign industry, and the finer sorts come to us from these sources. When the propagation and growth of sponge become better understood, and they become an applied industry, as they assuredly will, opportunities of studying the habitat of the various varieties and textures of this marine vegetable growth will be sought, and the means to further the object applied.

Rattlesnake Root from Senock.—This was the title and derivation of our seneca snake root, as given by an English drug merchant to an American correspondent as early as 1740. The value of the native or indigenous materia medica of America began very early in the history of the colonies to attract the attention of English drug merchants, and they became very eager to add to their stores those herbs, barks and parts of plants which traced their properties and uses solely to the domestic practice of the aborigines of America. England then, as now, produced no fruits, or even natural productions except cereals; all that grew was the result of artificial cultivation. Many foreign drugs were sent in exchange for our products, rhubark, seneca, and the spices figuring largely in our imports. Our people had brought some knowledge of the uses of these from the various "faderlands," but those of our soil possessed much of interest to foreigners. England began early in the history of commerce to take a conspicuous position. The products of every clime were carried to her stores largely in her own ships, and her chief city soon became an emporium for the whole earth, and the mart of the world. Among the beneficent designs which are seen in the works of Providence, Nature has purposely distributed her blessings among the different regions of the world, that inter-traffic should be promoted, and that the influences of civilization should flow from the intercourse of nations, the supplies of one region inviting the productions of another. Britain extended her domain and empire through the avenues of trade, and her merchants impressed a character upon the moral integrity of business, which holds to this day. In the drug trade, at the period referred to, the Quaker element

seemed to predominate. They are illustrious names in English pharmacy. They loved and pursued honesty and truth as dominant virtues of character. They were intelligent, God-fearing, and their written language is expressed in plain, mild, but forceful Anglo-Saxon. To their honor be it also said that they were staunch and loyal to the highest degree in maintaining the purity of medicines.

Chemists Exposed to Risk and Injury.—That is certainly a noble frame of mind which, by the force of will and purpose, takes from misfortune deplorable consequence, and often happily changes the current of occupation into channels where the individual can be equally, if not more, useful to society, and at the same time promote his own happiness. A noted chemist, losing an eye by an unfortunate laboratory mishap—an explosion—betook himself, as a means to restore health and divert the thought of his calamity, to the country for a partial residence. There he became, in order to acquire rudimentary knowledge, an agricultural laborer! Intelligence rapidly advanced him; by no tedious steps he adopted horticulture and fructiculture, until he had made a fame and a pecuniary success.

SIR JOSEPH LISTER ON ANTITOXINS.

The following, taken from the presidential address of Sir Joseph Lister before the British Association for the Advancement of Science, at the recent meeting in Liverpool, may be accepted as indicating the present status of diphtheria antitoxin, coming as it does from such an authentic source:

It was shown several years ago by Roux and Yersin, working in the Institut Pasteur, that the crust or false membrane, which forms upon the throats of patients affected with diphtheria, contains bacteria which can be cultivated outside the body in a nutrient liquid, with the result that it acquires poisonous qualities of astonishing intensity, comparable to that of the secretion of the poison-glands of the most venomous serpents; and they also ascertained that the liquid retained this property after the microbes had been removed from it by filtration, which proved that the poison must be a chemical substance in solution, as distinguished from the living element which had produced it. These poisonous products of bacteria, or toxins, as they have been termed, explain the deadly effects of some microbes which it would otherwise be impossible to understand. Thus

in diphtheria itself the special bacillus, which was shown by Löffler to be its cause, does not become propagated in the blood, like the microbe of chicken cholera, but remains confined to the surface on which it first appeared; but the toxin which it secretes is absorbed from that surface into the blood, and so poisons the system. Similar observations have been made with regard to the microbes of some other diseases, as, for example, the bacillus of tetanus, or lockjaw. This remains localized in the wound, but forms a special toxin of extreme potency, which becomes absorbed and diffused through the body.

Wonderful as it seems, each poisonous microbe appears to form its own peculiar toxin. Koch's tuberculin was of this nature, a product of the growth of the tubercle bacillus in culture media. Here again, great effects were produced by extremely minute quantities of the substance; but here a new peculiarity showed itself, viz.: that patients affected with tubercular disease, in any of its varied forms, exhibited inflammation in the affected part, and general fever after receiving under the skin an amount of the material which had no effect whatever upon healthy persons. I witnessed in Berlin some instances of these effects, which were simply astounding. Patients affected with a peculiar form of obstinate ulcer of the face showed, after a single injection of the tuberculin, violent inflammatory redness and swelling of the sore and surrounding skin; and, what was equally surprising, when this disturbance subsided the disease was found to have undergone great improvement. By repetition of such procedures, ulcers, which had been steadily advancing in spite of ordinary treatment, became greatly reduced in size and, in some instances, apparently cured. Such results led Koch to believe that he had obtained an effectual means of dealing with tubercular disease in all its forms. Unhappily the apparent cure proved to be only of transient duration, and the high hopes which had been inspired by Koch's great reputation were dashed. It is but fair to say that he was strongly urged to publish before he was himself disposed to do so, and we cannot but regret that he yielded to the pressure put upon him.

But, though Koch's sanguine anticipations were not realized, it would be a great mistake to suppose that his labors with tuberculin have been fruitless. Cattle are liable to tubercle and, when affected with it, may become a very serious source of infection for human beings,

more especially when the disease affects the udders of cows and so contaminates the milk. By virtue of the close affinity that prevails between the lower animals and ourselves, in disease as well as in health, tuberculin produces fever in tubercular cows, in doses which do not affect healthy beasts. Thus, by the subcutaneous use of a little of the fluid, tubercle latent in internal organs of an apparently healthy cow can be with certainty revealed, and the slaughter of the animal after this discovery protects man from infection.

It has been ascertained that glanders presents a precise analogy with tubercle as regards the effects of its toxic products. If the microbe which has been found to be the cause of this disease is cultivated in appropriate media, it produces a poison which has received the name of mallein; and the subcutaneous injection of a suitable dose of this fluid into a glandered horse causes striking febrile symptoms, which do not occur in a healthy animal. Glanders, like tubercle, may exist in insidious, latent forms, which there was formerly no means of detecting, but which are at once disclosed by this means. If a glandered horse has been accidentally introduced into a large stable, this method of diagnosis surely tells whether it has infected others. All receive a little mallein. Those which become affected with fever are slaughtered, and thus, not only is the disease prevented from spreading to other horses, but the grooms are protected from a mortal disorder.

This valuable resource sprang from Koch's work on tuberculin, which has also indirectly done good in other ways. His distinguished pupil, Behring, has expressly attributed to those researches the inspiration of the work which led him and his since famous collaborateur, the Japanese, Kitasato, to their surprising discovery of antitoxic serum. They found that if an animal of a species liable to diphtheria or tetanus received a quantity of the respective toxin, so small as to be harmless, and afterwards, at suitable intervals, successively stronger and stronger doses, the creature, in course of time, acquired such a tolerance for the poison as to be able to receive with impunity a quantity very much greater than would at the outset have proved fatal. So far, we have nothing more than seems to correspond with the effects of the increasingly potent cords in Pasteur's treatment of rabies. But what was entirely new in their results was that, if blood was drawn from an animal which had acquired this high degree of artificial immunity, and some of the clear

fluid, or serum, which exuded from it after it had clotted, was introduced under the skin of another animal, this second animal acquired a strong, though more transient, immunity against the particular toxin concerned. The serum in some way counteracted the toxin, or was antitoxic. But more than that, if some of the antitoxic serum was applied to an animal after it had already received a poisonous dose of the toxin, it preserved the life of the creature, provided that too long a time had not elapsed after the poison was introduced. In other words, the antitoxin proved to be not only preventative, but curative.

Similar results were afterwards obtained by Ehrlich, of Berlin, with some poisons not of bacterial origin, but derived from the vegetable kingdom; and quite recently the independent labors of Calmette, of Lille, and Fraser, of Edinburgh, have shown that antidotes of wonderful efficacy against the venom of serpents may be procured on the same principle. Calmette has obtained antitoxin so powerful that a quantity of it, only $\frac{1}{200000}$ part of the weight of an animal, will protect it perfectly against a dose of the secretion of the poison glands of the most venomous serpents known to exist, which, without such protection, would have proved fatal in four hours. For curative purposes larger quantities of the remedy are required, but cases have been already published by Calmette in which death appears to have been averted in the human subject by this treatment.

Behring's darling object was to discover means of curing tetanus and diphtheria in man. In tetanus the conditions are not favorable, because the specific bacilli lurk in the depths of the wound, and only declare their presence by symptoms caused by their toxin having been already in a greater or less amount diffused through the system; and in every case of this disease there must be a fear that the antidote may be applied too late to be useful. But in diphtheria the bacilli very early manifest their presence by the false membrane which they cause upon the throat, so that the antitoxin has a fair chance; and here we are justified in saying that Behring's object has been attained.

The problem, however, was by no means so simple as in the case of some mere chemical poison. However effectual the antitoxin might be against the toxin, if it left the bacilli intact, not only would repeated injections be required to maintain the transient

immunity to the poison perpetually secreted by the microbes, but the bacilli might, by their growth and extension, cause obstruction of the respiratory passages.

Roux, however, whose name must always be mentioned with honor in relation to this subject, effectually disposed of this difficulty. He showed by experiments on animals that a diphtheritic false membrane, rapidly extending and accompanied by surrounding inflammation, was brought to a stand by the use of the antitoxin, and soon dropped off, leaving a healthy surface. Whatever be the explanation, the fact was thus established that the antitoxic serum, while it renders the toxin harmless, causes the microbe to languish and disappear.

No theoretical objection could now be urged against the treatment, and it has, during the last two years, been extensively tested in practice in various parts of the world, and it has gradually made its way more and more into the confidence of the profession. One important piece of evidence in its favor in this country is derived from the report of the six large hospitals under the management of the London Asylums Board. The medical officers of these hospitals at first naturally regarded the practice with skepticism; but as it appeared to be at least harmless, they gave it a trial, and during the year 1895 it was very generally employed upon the 2,182 cases admitted, and they have all become convinced of its great value. In the nature of things, if the theory of the treatment is correct, the best results must be obtained when the patients are admitted at an early stage of the attack, before there has been time for much poisoning of the system, and, accordingly, we learn from the report that, comparing 1895 with 1894, during which latter year the ordinary treatment had been used, the percentage of mortality—in all the six hospitals combined—among the patients admitted on the first day of the disease, which in 1894 was 22·5, was only 4·6 in 1895; while for those admitted on the second day the numbers are 27 for 1894 and 14·8 for 1895. Thus, for cases admitted on the first day, the mortality was only one-fifth of what it was in the previous year, and for those entering on the second it was halved. Unfortunately, in the low parts of London, which furnish most of these patients, the parents too often delay sending in the children till much later; so that on the average no less than 67·5 per cent. were admitted on the fourth day of the dis-

ease, or later. Hence, the aggregate statistics of all cases are not nearly so striking. Nevertheless, taking it altogether, the mortality in 1895 was less than had ever before been experienced in those hospitals. I should add that there was no reason to think that the disease was of a milder type than usual in 1895, and no change whatever was made in the treatment, except as regards the antitoxic injections.

There is one piece of evidence recorded in the report which, though it is not concerned with high numbers, is well worthy of notice. It relates to a special institution to which convalescents from scarlet fever are sent from all the six hospitals. Such patients occasionally contract diphtheria, and when they do so, the added disease has generally proved extremely fatal. In the five years preceding the introduction of the treatment with antitoxin, the mortality from this cause had never been less than 50 per cent., and averaged, on the whole, 61·9 per cent. During 1895, under antitoxin, the deaths among the 119 patients of this class were only 7·5 per cent., or one-eighth of what had been previously experienced. This very striking result seems to be naturally explained by the fact that these patients being already in hospital when the diphtheria appeared, an unusually early opportunity was afforded for dealing with it.

There are certain cases of so malignant a character from the first that no treatment will probably ever be able to cope with them. But taking all cases together, it seems probable that Behring's hope that the mortality may be reduced to 5 per cent. will be fully realized when the public become alive to the paramount importance of having the treatment commenced at the outset of the disease.

THE PROPERTIES AND USES OF FORMALDEHYDE.[1]

By F. C. J. Bird.

The antiseptic and disinfectant properties of formaldehyde have been extensively investigated during the last two years, and the results obtained, both by bacteriologists and in the practice of various industries, have given it at once an important position amongst bactericidal agents. Formaldehyde is gaseous at ordinary temperatures, but is now obtainable, commercially, as a concentrated solu-

[1] *Pharmaceutical Journal*, September 26, 1896.

tion containing 40 per cent. of the aldehyde. Most of the published experiments have been made with this solution, which is placed on the market under various trade names.

Hoffman discovered formaldehyde in 1867. Loew subsequently demonstrated its germicidal powers, and Berlioz and Trillat suggested its use as a powerful disinfectant free from poisonous properties. It has the formula HCHO, is a powerful reducing agent, and when oxidized yields formic acid. A solid polymeric variety—paraformaldehyde—is also known. There are several chemical processes by which the aldehyde may be prepared, but the most practicable is that dependent on the limited oxidation of methylic alcohol. If a current of air charged with methylic alcohol vapor be passed over a coil of glowing platinum or platinized asbestos, and the escaping gases condensed in a Liebig's condenser, a weak solution of formic aldehyde in methyl alcohol results. The substitution for the platinum spiral of a roll of superficially oxidized copper gauze gently heated in a glass tube through which the mixed vapors are passed, the product being led into water, greatly increases the yield, it being possible by this means to obtain a solution containing 15 to 20 per cent. of formic aldehyde. The commercial solution, "formalin," is understood to be manufactured by a similar process to the foregoing, probably with improved details, by which a higher percentage strength in the product is ensured.

The 40 per cent. solution of formaldehyde, as met with in commerce, is a liquid of a pale. sea-green tint, specific gravity about 1·070, acid reaction, and possessing a pungent and very characteristic odor. In more concentrated solutions the formaldehyde tends to pass into the polymeric and comparatively inactive form; this, therefore, is the strongest solution which will remain permanent. The acidity is due to formic and acetic acids, and the faint sea-green tint to a salt of copper, a distinct film of that metal being deposited on a bright steel knife-blade when immersed in the liquid for a short time. When exposed to the air, formaldehyde vapors gradually diffuse, and the solution loses strength.

With regard to the toxicity or otherwise of formaldehyde in solution, when taken internally, no record of exact experiments relating to its physiological action on the human subject appears to exist, and information such as we possess concerning salicylic acid, carbolic acid, mercuric chloride, etc., is wanting. The solid polymer

may be given in doses up to 90 grains as an intestinal antiseptic, its action depending on small quantities of formaldehyde that are continuously liberated; and this is put forward as one proof of the harmless nature of the antiseptic. Dr. Rideal is said to have taken a considerable quantity of a 1 per cent. solution without experiencing any ill effects.

Formaldehyde ranks high as a deodorant. Either as vapor or in solution it almost instantly removes the putrid odor of decomposing animal or vegetable matter, combining with sulphuretted hydrogen, mercaptan, ammonia and ammonia bases generally to form inodorous compounds. With ammonia it gives hexamethyleneamine. Putrid meat, broth, urine, fæces, etc., are immediately deodorized when treated with a little of the 40 per cent. solution.

The vapors given off by the solution are extremely irritating to the eyes and the mucous membrane of the nose and throat, so that care should be taken when handling the solution not to spill any on the hands or skin, as it is found to have a similar effect to strong carbolic acid. No pain is felt at the moment, but afterwards the skin becomes quite insensitive, and very rough and white wherever the liquid has been in contact with it.

Gelatin exposed to formaldehyde vapor becomes insoluble even in hot water, and animal tissues generally are hardened in a remarkable manner. This property is turned to account in the rapid hardening of tissues for microscopical examination, and in photography; Dr. C. L. Schleich has also prepared from the formalized gelatin an antiseptic dusting powder for wounds. Dr. Schleich dissolves gelatin in water, adds 25 minims of "formalin" to the pound of gelatin, and dries and powders the product. This powder, in contact with healthy or inflamed tissue, disengages formaldehyde vapor, thus maintaining an antiseptic atmosphere around the wound. Necrotic tissue or masses of dried secretion may prevent contact between the powder and the wound, in which case recourse is had to a weak hydrochloric solution of pepsin, which liberates formaldehyde from the powder equally as well as the living tissue.

As a hardening agent in microscopy, and for the preservation of vegetable structures, formaldehyde solution promises to be of the greatest service. Mr. E. M. Holmes, F.L.S., read an interesting paper on this subject some months since, and his experience confirms the statements that have been made as to the advantages of

formaldehyde over such solutions as chromic acid and mercuric chloride or even absolute alcohol. Dr. Eccles, writing to the *British Medical Journal*, has stated that, whilst the last-named reagents required a period of time ranging from four or five to fourteen days, and the tissues either became brittle and unequally hardened or the staining was interfered with, those sections treated with formaldehyde were sufficiently hardened in three days, did not become brittle and stained well, the cells retaining their original shape.

A Solution of Formaldehyde Containing	Effects Produced.
1 part in 125,000 parts . .	Kills anthrax bacilli.
" 50,000 " . .	Prevents the development of typhus bacilli, etc.
" 32,000 " . .	Preserves milk for several days.
" 25,000 " . .	Forms a useful injection in leucorrhœa, etc.
" 20,000 " . .	Preserves wines, weak alcoholic liquids and beer, also milk for several weeks.
" 4,000 " . .	Recommended for moistening paper used to cover jam, etc.
" 3,200 " .	For rinsing dairy vessels, etc.
" 2,500 " . .	Destroys the most resistant micro-organism in one hour.
2,000 " . .	For rinsing casks and vessels intended for liquids liable to fermentation.
" 500 " . .	For the irrigation of catheters, etc., and as a mouth-wash.
" 250 to 200 " . .	A general disinfectant solution for washing hands, instruments, etc., in surgery, spraying in sick-rooms and as a deodorant.
" 160 to 100 " .	For hardening microscopic tissues, which should be immersed for a considerable time to give the best results.
" 100 " . .	In lupus, psoriasis and skin diseases.
" 50 to 25 " . .	Sterilizes surgical catgut, silk, etc., by steeping.
" 25 " . .	For quickly hardening and preserving for microscopical sections; longer immersion in a weaker solution gives better results.
" 10 " }	For hardening firm tissues } in pathological
" 5 " } . .	" tissues } and histological
" 2½ " }	" " } work.

The foregoing table gives the purposes for which formaldehyde has been employed, and the proportions recommended. Two and

one-half parts of the 40 per cent. solution may replace each part of formaldehyde.

The practice of employing formaldehyde as a preservative for milk has of late become very general amongst dairymen, with the result that much attention has been directed to methods for its detection. As will be seen from the above table, the proportion necessary is so small that any test to be of service must be exceptionally delicate, and although the qualitative reactions in use do not generally fail in this respect, most of them possess the disadvantage of being common to aldehydes generally. The more important are the following: Ammonio-nitrate of silver, Schiff's reagent, diphenylamine, Hehner's casein-sulphuric test, the phenol-sulphuric test, the chromate test, the micro test with ammonia, and Nessler's reagent.

QUALITATIVE TESTS FOR FORMALDEHYDE.

Ammonio-nitrate of Silver.—This reaction is moderately delicate, but is given by other aldehydes. It will not detect the faint traces which are readily recognizable by Hehner's casein-sulphuric acid and the phenol-sulphuric test. The distillate from many organic liquids gives a slight browning with this reagent which detracts from its usefulness.

Schiff's Reagent (rosaniline, sodium sulphite and hydrochloric acid) is colorless, but with aldehydes gives a reddish violet color. Richmond and Boseley point out that the solution should always contain excess of acid, as alkalis turn it pink, and free acid does not interfere with the violet tint due to aldehyde. According to Hehner the best way of operating is as follows: Distil 25 c.c. from the liquid under examination, place in a stoppered cylinder, and next morning add a few drops of sulphurous acid. The rose color due to oxidation disappears, whilst the violet tint due to aldehyde remains. This test is only useful for confirmation, as it reacts with other aldehydes.

The Diphenylamine Test (Richmond and Boseley).—Distil the liquid, such as milk, etc., into an aqueous solution of diphenylamine, in the preparation of which just sufficient sulphuric acid has been used to effect solution. If formaldehyde be present, a white, flocculent precipitate is deposited, which often has a green tinge. This test is inferior to Hehner's and Schiff's, and is not very delicate.

Hehner's Casein-sulphuric Test.—Add one drop of milk to the sample and pour the mixture carefully on the surface of strong sulphuric acid contained in a test tube. A blue ring appears at the zone of contact when a trace of formaldehyde is present, but the reaction is not obtained with ordinary aldehyde, nor does much formaldehyde give it. Care being taken that the solution is very dilute, this appears to be a thoroughly distinctive test; it is very sensitive, and will detect 1 part of formaldehyde in 200,000. The production of the blue color probably depends on the presence of casein in the milk. In testing milk for formaldehyde, distillation may be avoided by diluting the milk with an equal volume of water and carefully adding sulphuric acid of 90 to 94 per cent. strength. In the absence of formaldehyde a faint greenish tinge appears at the junction of the two liquids, but if present a violet ring is developed.

The Phenol Sulphuric Test is described by O. Hehner[1] as being equally as sensitive and characteristic as the foregoing, with the further recommendation of answering with all proportions of formaldehyde. To the distillate from the sample of milk, or other liquid under examination, add one drop of a dilute aqueous solution of phenol, and pour the mixture on the surface of strong sulphuric acid contained in a test tube. A bright crimson color appears at the line of contact. This detects 1 in 200,000, and if more than 1 in 100,000 be present, there is seen above the red ring a white, milky zone, and, in stronger solution, a white or pinkish precipitate. It is important that only a trace of phenol be used (I find ½ grain to the ounce a suitable strength for the solution) and that the test be carried out exactly as described. A dilute solution of phenol, without formaldehyde, poured on strong sulphuric acid, gives a colored zone, crimson above and green below, therefore excess must be avoided. The colored ring due to formaldehyde is crimson below, merging into yellow above. Acetaldehyde gives an orange precipitate, not a crimson color. Other benzene hydroxy-derivatives may be used in place of phenol, as salicylic acid, resorcinol and pyrogallol; they all yield the red color.

The Chromate Test (C. D. Mitchell).—1 c.c. nitric acid with 1 c.c. of a solution of bichromate of potash forms a reagent which, added

[1] *Analyst*, April, 1896.

to the distillate from a liquid containing formaldehyde, produces an intense violet coloration. This does not appear to be a very delicate test, as I have not been able to obtain the reaction with traces of formaldehyde.

Nessler's Reagent gives a distinct yellow precipitate with a solution containing 1 part of formaldehyde in 200,000. It, therefore, lacks nothing in delicacy, and as the reagent is always to be found on the shelves of the pharmacy, it may be recommended as the most convenient test. With solutions of 1 part of formaldehyde in 50,000 to 100,000 a yellowish opalescence first appears, quickly changing into a copious orange precipitate, which, on standing or gently heating, becomes darkened in color and reduced. From 1 in 100,000 to 1 in 200,000 the opalescence develops into a lemon-yellow precipitate on standing, and little or no reduction takes place. The effect produced by formaldehyde is quite distinct from that of a weak solution of ammonia giving about the same depth of color. The latter remains quite clear and transparent even on boiling. With strong solutions of acetaldehyde an orange precipitate and immediate reduction occurs, the same as with formaldehyde, but traces hardly affect Nessler's reagent, and when acetaldehyde is present in sufficient quantity to even communicate its odor to the liquid a yellow precipitate is the only result. The reaction of acetaldehyde with Nessler's reagent is very much less energetic than that of formaldehyde, and there is little risk of confounding the two aldehydes, when traces only are present, such as would be met with in the ordinary course of analysis.

The Ammonia Micro Test (Remijn).—The substance or liquid suspected to contain formaldehyde is distilled with water, a drop of the distillate evaporated on a slide with a drop of ammonia, and the crystalline residue tested with mercuric chloride in excess. Crystals are immediately formed, hexahedral at first, but becoming octahedral after a time. The crystals are easily obtained from a 1 in 10,000 solution, and are visible in a 1 in 100,000 solution. The evaporated residue also gives precipitates with platinic chloride, phosphomolybdic acid and other alkaloidal reagents.

THE QUANTITATIVE DETERMINATION OF FORMALDEHYDE.

There are several methods by which formaldehyde may be quantitatively determined:

(1) The solution may be directly titrated with standard solution of ammonia, rosolic acid being used to indicate the complete conversion of the formaldehyde into hexamethyleneamine.

(2) Excess of standard ammonia having been added, the solution may be titrated back again with standard acid.

(3) The solution may be evaporated to dryness with excess of standard ammonia and the hexamethyleneamine weighed, the formaldehyde being calculated from the following equation:

$$6CH_2O + 4NH_3 = (CH_2)_6N_4 + 6H_2O.$$

(4) The solution containing formaldehyde may be heated for several days in a closed vessel on a water-bath with excess of sodium hydrate; sodium formate and methyl alcohol are produced, and the excess of sodium hydrate is determined by titration with acid (Allen).

(5) The insolubility of the precipitate formed by sulphuric acid, phenol and formaldehyde in the phenol-sulphuric test has led O. Hehner to suggest its utilization for the determination of formaldehyde in dilute solutions. It must be borne in mind that the whole of the formaldehyde cannot be separated by distillation, even when three-fourths of the volume of the liquid containing it has been collected as distillate; the first four of the foregoing methods, therefore, if accurate results be desired, are only applicable to solutions in which no other interfering constituent exists. Some other way of removing the formaldehyde is apparently necessary for its exact quantitative determination in complex mixtures.

ECONOMIC APPLICATIONS OF FORMALDEHYDE.

Formaldehyde, as shown by Slater and Rideal, when employed of such a strength in weak alcoholic liquids as to be fatal to lactic and butyric acid organisms and other bacteria which produce injurious secondary fermentation, does not interfere with the growth of the yeast plant, nor does it hinder in any way the formation of alcohol. This fact has been turned to account in the brewing industry for producing pure cultivations of yeast, and preventing souring, cloudiness, or ropiness in the finished product; it should also prove equally useful in ensuring soundness in such fermented liquids as orange and ginger wines, perry, cider, etc. The proportion necessary is from 1 in 10,000 to 1 in 20,000.

This illustrates a striking peculiarity in the antiseptic action of formaldehyde; for whilst it exerts an intensely powerful inhibitory effect on bacteria generally, especially those of putrefaction, in contrast it has but a comparatively feeble influence in preventing the development of the lower forms of plant life. Hence, vegetable solutions preserved by its aid, although retaining their color and other physical characters to a remarkable degree, are exceedingly prone to develop mouldy growths, etc., and if this is to be avoided, the proportion of antiseptic must be increased to an extent far greater than required to simply arrest putrefactive change.

Meat, fish, etc., may be kept for several days during the hottest weather by placing it in a well-covered dish with a tuft of cotton-wool moistened with from 4 to 8 drops of solution of formaldehyde. The antiseptic vapor does not communicate the slightest odor or taste to the meat, etc., and, after considerable experience of this method, I have never found it fail to maintain the articles absolutely untainted for four or five days, even under the severest conditions of temperature.

Disinfection by formaldehyde vapor generated directly from methylic alcohol has lately attracted considerable attention. The simplest form of apparatus for the purpose consists of an ordinary spirit lamp provided with a coil or spiral of platinum extending about 1 inch above the wick. After lighting the lamp and allowing the platinum to become red hot, the flame is extinguished. The platinum continues to glow in contact with the air and methylic alcohol vapor, and the latter rising from the wick becomes partially converted into formaldehyde, the action being maintained as long as any methyl alcohol remains in the reservoir. In this apparatus, a large proportion of the alcohol escapes oxidation and, in consequence, several improved forms have been devised. In one, resembling a plumber's blow-lamp, a stream of methylic alcohol vapor is directed upon incandescent platinum; there are also air-holes, which can be so adjusted as to regulate the proportions of air and alcohol vapor; in this lamp the greater part of the alcohol is converted. Formaldehyde vapor may also be generated in an apartment by spraying the solution into the atmosphere or heating it in an evaporating dish. Diffusion, however, is slow in the latter case, as has already been stated, and it is much better to allow the solution to fall drop by drop on a heated plate of metal. A handy ar-

rangement for effecting this consists of a tinplate tray supported on the ring of a retort stand, and heated by a spirit lamp, the formaldehyde solution being contained in a glass separator held in an upper ring of the stand, and, by regulation of the stopcock, allowed to drop slowly on to the heated tray beneath. Careful experiment has shown that disinfection with formaldehyde vapor is most thorough and effective, the vapor diffusing very rapidly and penetrating everywhere, dust on the walls, in the air, and even in cupboards, being almost immediately sterilized. Owing to the irritating nature of the formaldehyde fumes on the mucous membrane and air passages, it is imperative that, after disinfection by this means, currents of air should be allowed to pass through the apartment for a quarter of an hour before entering it, whilst complete removal of the disinfectant should be ensured by free ventilation for at least two days.

THE COLORING MATTER OF QUEBRACHO COLORADO.

An investigation of the coloring matter of Quebracho Colorado is reported by Perkin and Gunnell (*Proc. Chem. Society*, 1896, p. 158).

The wood of Quebracho Colorado constitutes the tannin matter "quebracho," which is suitable for the production of morocco leather, and, moreover, in conjunction with alum, it gives the leather a bright yellow shade, instead of the darker colors prepared in the ordinary way. Jean (*Bull. Soc. Chim.*, **33**, 6) found it to contain a tannin differing from those of oak bark and chestnut wood. According to Arnaudon (*Watts' Dict. Chem.*, **8**, 1732), it contains a yellow coloring matter.

The coloring matter $C_{15}H_{10}O_6$ forms glistening yellow needles, dyeing shades similar to those of quercetin, and yielding compounds with mineral acids. The benzoyl derivative $C_{15}H_6O_6(C_7H_5O)_4$ forms colorless needles, having a melting point of 180–181°, and the acetyl derivative $C_{15}H_6O_6(C_2H_3O)_4$ is in the form of colorless needles, melting at 196–198°. Fused with alkali it yields protocatechuic acid and probably resorcinol. Its dyeing properties are found to be identical with those of fisetin, $C_{15}H_{10}O_6$, the coloring matter of young fustic (Rhus cotinus), and there can be little doubt that it is fisetin.

The authors also report the presence of ellagic and gallic acids, which are thought to be formed chiefly during the isolation of the fisetin from the quebracho.

EDITORIAL.

SOME NOTABLE PRESIDENTIAL ADDRESSES.

The season of annual scientific meetings may be said to have recently closed both in this country and in England. Among the great number of addresses which have been delivered, four stand out conspicuously. In this country those of William Trelease, before the Botanical Society of America, and of Nathaniel L. Britton, before Section G of the American Association for the Advancement of Science, are especially worthy of perusal. Dr. Trelease's address, on "Botanical Opportunity," has been printed in full in the *Botanical Gazette* for September. It is not a paper that will bear condensation, but it may be noted that one thing especially is shown which should be a comfort to every struggling botanist, viz.:

> For most of us opportunity of life does not lie in a great and abrupt change of condition, but that it is composed of countless minor chances, which are great only when viewed collectively. To see and use them calls for alert senses, a knowledge and use of the means of ascertaining what has already been done, and, by exclusion, something of what remains to be done, facilities adequate to the task in each case, and indomitable perseverance and ceaseless activity. Great as the value of facilities is, they are merely means to an end. They accomplish nothing themselves. Hence, though it is certain that the most voluminous and, perhaps, the most comprehensive results, and those resulting from the performance of coherent experiments extending through a long series of years, will come from the great centres of research, there is no reason why qualitative results equal to the best may not continue to come as they have in the past, from isolated workers, to the rounding out and completion of whose studies the facilities of the larger institutions will be more and more applicable as the problems of equipment are worked out.

Professor Britton's address before the Botanical Section of the American Association for the Advancement of Science was on the subject of "Botanical Gardens," their origin and development. As might be expected, those of the United States receive a large share of attention. This address was printed in *Science*, September 4th, and in the *Alumni Journal* of the New York College of Pharmacy, for October; it is especially worth the studious attention of botanists.

The foreign addresses are equally noteworthy with those delivered in America, one by Sir Joseph Lister, and the other by Ludwig Mond. The one by Sir Joseph Lister, on "The Interdependence of Science and the Healing Art," was a presidential address before the British Association for the Advancement of Science, and was printed in the *Chemical News* for September 18th and 25th; that by Ludwig Mond appeared in the same journal for September 25th and October 2d, and in the *Pharmaceutical Journal* for September 26th, and was delivered before the Chemical Section of the same Association. It was devoted to "A Brief History of the Manufacture of Chlorine."

Sir Joseph Lister's address naturally covered a range of topics, but from his relation to modern antiseptic surgery, he was in a position to speak as a master, and he did it. On page 612, of this issue, we have printed his remarks on antitoxin, which we believe is a concise and accurate statement of the condition of this subject at the present time. We regret that the other matters touched on by the speaker cannot also be produced here in full, especially the summary of work done by Pasteur.

Ludwig Mond spoke with authority on his subject, and recited a complete

history of the chlorine industry, which necessarily included that of the production of alkali. The rise and development of each one of the various processes, with their defects, were outlined, including the latest electrolytic methods, which he summed up as follows:

Only two electrolytic works, producing chlorine on a really large scale, are in operation to-day. Both electrolyse chloride of potassium, producing as a by-product caustic potash, which is of very much higher value than caustic soda, and of which a larger quantity is obtained for the same amount of current expended. These works are situated in the neighborhood of Stassfurt, the important centre of the chloride of potassium manufacture. The details of the plant they employ are kept secret, but it is known that they use cells with porous diaphragms of special construction, for which great durability is claimed. There are at this time a considerable number of smaller works in existence, or in the course of erection in various countries, intended to carry into practice the production of chlorine by electrolysis by numerous methods, differing mainly in the details of the cells to be used, but some of them also involving what may be called new principles. The most interesting of these are the processes in which mercury is used alternately as kathode and anode, and salt as electrolyte. They aim at obtaining in the first instance chlorine and an amalgam of sodium, and subsequently converting the latter into caustic soda by contact with water, which certainly has the advantage of producing a very pure solution of caustic soda. Mr. Hamilton Castner has carried out this idea most successfully by a very beautiful decomposing cell, which is divided into various compartments, and so arranged that by slightly rocking the cell the mercury is charged with sodium in one compartment, passes into another, where it gives up the sodium to water, and then returns to the first compartment to be recharged with sodium. His process has been at work for some time at Oldbury, near Birmingham, and works for carrying it out on a large scale are now being erected on the banks of the Mersey, and also in Germany and America.

JUBILEE OF ANÆSTHESIA.

In 1846, on the 16th of October, the utility of ether as an anæsthetic in major surgery was demonstrated to the world in the Massachusetts General Hospital, of Boston, by Dr. William T. G. Morton, of that city. Not only has this discovery added to the triumphs of modern surgery, but if all the sufferers who have been benefited by its application could express their gratitude, who can doubt that the occasion would be a jubilee indeed?

On the 16th of October the semi-centennial of the event was celebrated in Boston in the institution in which was first realized the far-reaching possibilities of anæsthesia. That the ceremonies were in every way fitting, may be seen from the following outline:

Address of welcome, by Charles H. Dalton, Esq., President of the Massachusetts General Hospital.

"Reminiscences of 1846," by Dr. R. T. Davis, of Fall River, and Dr. Washington Ayer, of San Francisco.

"Surgery before Anæsthesia," by John Ashhurst, Jr., M.D., of Philadelphia.

"What Anæsthesia Has Done for Surgery," by David W. Cheever, M.D., of Boston.

"Relation of Anæsthesia and Obstetrics," by John P. Reynolds, M.D., of Boston.

"The Influence of Anæsthesia upon Medical Science," by W. H. Welch, M.D., of Baltimore.

"The Surgery of the Future," by Charles McBurney, M.D., of New York.

"The Birth and Death of Pain," a poem, by S. Weir Mitchell, M.D., of Philadelphia.

The humanitarian, no less than the scientific, spirit of the period was shown by the universal interest in the celebration.

However strong the claims of others to priority in this discovery, the claims of Dr. Morton to distinction remain paramount, for he it was who, with that sublime faith in a principle, persisted in experiments, administering ether to himself and others, as well as to the lower animals, until its efficacy was an established fact.

DEATH OF AN EMINENT BOTANIST.

The death of *Baron Ferdinand von Mueller* was reported from Melbourne, Australia, October 9th. Death was attributed to apoplexy. The deceased was born at Rostock, Germany, in 1825. He studied medicine and natural science at the University of Kiel. In 1847 he extensively explored Australia and became Government Botanist of the colony of Victoria in 1852. He has received many honorary decorations and medals, and was elected an honorary member of the Philadelphia College of Pharmacy in April, 1893. Of his numerous contributions to science, his best known was "Select Extra Tropical Plants," the ninth edition of which appeared in 1895.

AN EXPLANATION.

The author of the paper on "Oleomargarine and Wasting Diseases," which we commented on in our October issue, has furnished us with abundant evidence that he was in no way connected with the use made of his paper by a beef-packing house of Chicago for advertising purposes. In clearing himself, however, the author has placed the aforesaid beef-packing house in a very unenviable position, and has shown that what he intended for a strictly scientific paper they garbled so as to make an advertising circular for themselves, and used it without permission.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

NUEVA FARMACOPEA MEXICANA DE LA SOCIEDAD FARMACÉUTICO DE MÉXICO. Tercera Edicion.

Corregida, aumentada y arreglada por los Profesores Alfonso Herrera, Alfonso L. Herrera, Alejandro Uribe, Jose Maria Lasso de la Vega, Manuel F. De Jauregui, Juan B. Calderon, y Severiano Perez, Mexico, 1896.

The second edition of the Mexican Pharmacopœia was extensively reviewed by Professor Maisch in the volumes of this journal for 1885–86; therefore, a detailed notice of the various drugs and their preparations need not be repeated now. The third edition, however, has been considerably enlarged, the volume being a quarto of 589 pages; 195 new articles have been added. The divisions of the work are practically the same as in the former edition, namely, Part I is introductory and contains the tables of weights and measures, reagents, volumetric solutions, etc. Part II is devoted to natural products, vegetable, animal and mineral. This is followed by the Pharmacopœia proper, which is divided into two parts, one being devoted to chemical products and the other to pharmaceutical preparations.

The natural products described in Part II are treated alphabetically and are considered almost as fully as the crude drugs in this country are described in the dispensatories. For example, the description of aconite is subdivided as

follows: Name and natural order, habitat, part employed, physical characters, chemical composition, substitutions, medical properties, dose. As a compact description of the raw materials used in the medicine of Mexico, this part is a decided success.

In admitting chemical products the authors have not allowed themselves to be influenced by such substances having copyrighted names; for instance, we find phenacetine, europhen, exalgine, etc. Some of these remedies, however, have been differently treated, as instanced in the case of antikamnia, which has been placed among the pharmaceutical preparations with a formula, as follows:

Antifebrine	70·00
Sodium bicarbonate	19·50
Caffeine	10·00
Tartaric acid	0·50

Dose, 20 to 60 centigrammes.

Antifebrine is used as a synonym for acetanilid, the latter having a place in the work under chemical products.

There are many new formulas among the pharmaceutical products, most of which reflect credit on those having that portion in charge.

The index is very complete, Spanish, Latin and English titles being included.

The whole is a very creditable work, containing a vast amount of useful information, well worth the careful consideration of both physician and pharmacist.

AN ILLUSTRATED FLORA OF THE NORTHERN UNITED STATES, CANADA AND THE BRITISH POSSESSIONS, from Newfoundland to the Parallel of the Southern Boundary of Virginia, and from the Atlantic Ocean Westward to the One-hundred-and-second Meridian. By Nathaniel Lord Britton, Ph.D., and Hon. Addison Brown. In three volumes. Vol. I, Ophioglossaceæ to Aizoaceæ—Ferns to Carpet Weed. New York: Charles Scribner's Sons. 1896.

The appearance of the first volume of the "Illustrated Flora of North America" marks a distinct advance in systematic botany, and in the literature of that science in America. The enormity of the undertaking to illustrate in this work every known species in the territory whose flora is described, is realized when it is known that upwards of 4,000 species will be thus presented. Illustrations of about three-fourths of these have never before been published. This gives some slight conception of the enormous labor and attention to details necessitated.

The size of the volume (royal 8vo, and pp. 612), style and typography are all commendable. The illustrations are, in most part, drawn from herbarium specimens, and reduced considerably in size in order to get the work into the compact sphere necessitated by the desire to make this work the standard guide for collectors and all students of our flora. Despite the facts of reduction in size and the absence of coloring, the plants are admirably presented by line drawings. The stems are frequently shown as if doubled or cut, as they often appear in herbarium specimens, and the illustrations of the characteristic structural features of the species are especially to be commended.

The drawings of such characters as the scales in Gramineæ, and the achenes and bristles in illustrating the Cyperaceæ, are generally well executed, and

will greatly enhance the value of the work to the students of these difficult groups. No matter how carefully the descriptions are worded, the idea is impressed more positively and permanently by illustration.

The order of presentation of subjects is in accordance with the classification adopted by Engler and Prantl in *Natürliche Pflanzenfamilien*, and now very generally followed in the recent floras of European publication, the sequence being from plants of simple structure to those of the more complex. Excellent keys are provided to aid the student in analysing plants.

The volume before us commences with the Pteridophyta, and this sub-kingdom is considered in 48 pages. In the sub-kingdom Spermatophyta, the Gymnospermæ are first considered, and Pinaceæ replaces Coniferæ as the name of the Pine family.

The assistance of such able specialists as Porter, Bicknell, Underwood, Coville, Small, Nash, Scribner, Sheldon and the late Rev. Thos. Morong, adds additional authority to the volume.

The rules of nomenclature of the Botanical Club of the American Association for the Advancement of Science are rigidly adhered to, even to the acceptance of such binomials as Fagopyrum Fagopyrum, Corallorhiza Corallorhiza, Phegopteris Phegopteris, Hystrix Hystrix, etc. It is fortunate that such binomials are not very numerous. The many changes in names necessitated by the law of priority are here given, and, accompanied by the extensive synonymy, will render the work invaluable to a host of botanists who want to follow a standard authority, and have neither time nor desire to make a special study of synonymy and priority.

The accentuation of both generic and specific names is carefully noted in each instance, in accordance with the rules laid down in the introduction. Popular English names are given for each species, and where several names are used locally for the same plant, the most desirable is selected, or, where a good popular name does not exist, a suitable name is coined. While such names are not essential to the botanist, it behooves us to exert our influence in favor of having correct popular names universally adopted.

The geographical distribution for each species is carefully noted, and in some cases the authorities for such statements are quoted. The limits of altitude are, wherever possible, given, and this is a feature which, heretofore, has not received proper consideration in American botanies.

This work should tend to greatly popularize the study of plants. The price, $3, is very moderate for such a comprehensive volume, and every botanist should subscribe at once for it, so as to encourage the authors and publishers to promptly issue the remaining two volumes. We await their appearance, convinced in advance that they will merit the same welcome and approval that Volume I has received. G. M. B.

A Manual of Materia Medica and Pharmacology. By David M. R. Culbreth, Ph.G., M.D., Professor of Botany, Materia Medica and Pharmacognosy in the Maryland College of Pharmacy. Lea Bros. & Co., Philadelphia and New York. 1896. Pp. 818.

Part I is devoted to organic drugs from the vegetable kingdom, and constitutes the bulk of the book, or 555 pages. Part II treats of organic drugs from the animal kingdom. Part III is devoted to inorganic drugs from the mineral

kingdom. Part IV considers organic carbon compounds. Part V discusses non-pharmacopœial organic carbon compounds. Part VI is devoted to the microscope and its use in materia medica.

The book, as a whole, has many features that will recommend it to the pharmacist and student. A considerable amount of space is devoted to some general subjects, like definitions of pharmaceutical terms and of classes of preparations, as vinegars, waters, etc., the avenues by and through which medicines enter the system, incompatibility, and some other topics not often found in books for pharmacists.

Part I opens with the Ranunculaceæ. The order of treating each is somewhat different from that in a number of other works on this subject. The Latin and English names of the drug are first given, then botanical origin, part employed, synonyms, description of the plant yielding the drug, adulterations, constituents, preparations, properties and uses, followed in many cases by a description of allied plants or drugs.

Numerous tabular recapitulations, occupying two adjacent pages, are distributed through the book, which will be of assistance to the student in making comparative studies.

The book is fully illustrated, and in a manner to be of advantage to the student, although a few inaccuracies of illustration may be observed, notably the one of Quercus alba, which only resembles that species in the shape of the acorns; the other characters bear a close resemblance to the European Quercus pedunculata. It is doubtful whether the extremes of variation allowed the oaks ever produced a white oak like the illustration; certainly it is not typical.

It may be said of Part III, devoted to inorganic drugs from the mineral kingdom, that the author has made the most out of a condensation of such a vast amount of material into a little over 100 pages.

The closing part of the book, devoted to a consideration of the microscope and its accessories, will be found of use to all who wish to have a true knowledge of botany and materia medica, that is a knowledge founded on observation instead of temporarily on memory alone.

BOTANY (Phanerogams and Vascular Cryptogams). By Baron F. von Mueller and Professor Ralph Tate. Reprinted from *Transactions of Royal Society*, South Australia, Vol. 16.

PROCEEDINGS OF THE PENNSYLVANIA PHARMACEUTICAL ASSOCIATION. Nineteenth annual meeting, at Mt. Holly Springs, Pa., June 16–18, 1896.

PROCEEDINGS OF THE TENNESSEE STATE DRUGGISTS' ASSOCIATION. Eleventh annual meeting, at Chickamauga, Tenn., July 15–16, 1896.

ESSAI DES MÉDICAMENTS NOUVEAUX. Par Et. Fayn. Extrait du *Journal de Pharmacie d'Anvers.*

The author considers it of the greatest importance that pharmacists should know the properties and methods of preparing the numerous new substances which are forced upon him. He has, therefore, given the name and synonyms, preparation, physical properties, solubilities, therapeutics and dose, and method of assaying a number of the best known new compounds. Working formulas for substances like bismuth subgallate, glycerophosphate of calcium, salipyrine, etc., are given in full.

ON TRIMETAPHOSPHIMIC ACID AND ITS DECOMPOSITION PRODUCTS. By H. N. Stokes. Reprinted from *American Chemical Journal*, October, 1896. This paper describes the third member of the metaphosphimic acid series, and details its decomposition products. It is shortly to be followed by an account of tetrametaphosphimic acid.

REPORT OF THE WORK OF THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNIVERSITY OF CALIFORNIA FOR 1894–95.

This report is a valuable one, and a number of illustrations add to its interest. Some of the subjects may be noted. Under the head of "Starch in Buckeye Fruit (Æsculus Californica)" are given results of an analysis which show that the buckeye fruit contains a much lower percentage of starch than either corn or potatoes, and is, therefore, not as rich a material for the manufacture of this substance as has been supposed. The portion entitled "Examination of Licorice Roots" we give in full on page 636, of this number of the JOURNAL. Considerable space is devoted to "The Canaigre or Tanners' Dock."

PROCEEDINGS OF THE THIRTEENTH ANNUAL CONVENTION OF THE NATIONAL CONFECTIONERS' ASSOCIATION OF THE UNITED STATES, held at Cleveland, July 9 and 10, 1896.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, October 20, 1896.

The first of the series of Pharmaceutical Meetings of the Philadelphia College of Pharmacy for 1896–97 was held in the College Museum, with Prof. Samuel P. Sadtler in the chair.

The reading of the minutes of the last meeting having been dispensed with, the next in order was the reading of original communications. The programme embraced an interesting variety of subjects, the first of which was "A History of the Pharmaceutical Meetings of the Philadelphia College of Pharmacy," by Thomas S. Wiegand (see p. 605). The original plan of conducting these meetings has undergone but little change since their inauguration. It was early determined not to introduce matters of a business character; and at a meeting of the College, September 27, 1842, an amendment to the by-laws, providing that the pharmaceutical meetings should be limited exclusively to scientific subjects, was adopted. Perhaps, in no better way can the benefits which have accrued to American pharmacy from these meetings be judged than by the fact that over 500 papers have been reported through their instrumentality.

The discussion which followed the paper was mainly reminiscent.

"Antimonii Oxidum and Pulvis Antimonialis," was the subject of a paper by Charles H. LaWall (see page 597).

The author gave the official history of these drugs and described the various processes which have been used for their manufacture. The higher oxides of antimony were also considered, together with test methods for distinguishing them. Six samples of the oxide in question were analyzed, and three methods

for determining the percentage of antimony were employed in each case. Of four samples obtained in the market, one was found to be stibic acid, another was inferior in appearance, but answered the other requirements fairly well, and two were U.S.P. in every respect.

Mr. J. W. England stated that the antimonial compounds were not used nearly so much as formerly, and that tartar emetic was chiefly employed in making wine of antimony. He attributed their decline in the favor of physicians to their variability in composition, and said that the antimonous oxide, which most frequently enters into the composition of the other preparations, was often contaminated with antimonic oxide, and was consequently of a dangerous character.

Dr. C. B. Lowe thought that another reason for their disuse was the fact that formerly they were used in surgical practice to produce nausea and relaxation prior to operations, and this method having been superseded by the use of anæsthetics, their employment has diminished.

A paper by Mr. England was announced on the programme, but he reported that his results, which were not yet ready, would be given at a future meeting.

A highly interesting and instructive paper, entitled "A Botanical Excursion to Mexico," was presented by John W. Harshberger, of the University of Pennsylvania (see page 588).

Dr. Harshberger found the plateau upon which the city of Mexico is located a rich and unique field for the study of botany. He said that the plants in this region might be grouped into a number of communities, and that within a radius of a few miles, owing to certain physical and meteorological conditions, were found representatives of the aquatic, alpine, desert and tropical floras and that thus was afforded an excellent opportunity for the study of plants with reference to environment. Accompanying this paper were a collection of herbarium specimens, including the flowers of several species of native dahlias, and also growing specimens of two species of the century plant, Agave megalacantha and Agave Americana.

A contribution on "The Tannin of Some Acorns" was read by Prof. Henry Trimble (see page 601).

It was found that the testa or thin membrane surrounding the cotyledons was the part of the acorn containing the highest percentage of tannin, that of Quercus Prinus yielding from 42·10 to 48·09 per cent. The cupule (which is the most easily utilized for the production of tannin) of this species contained from 13·37 to 18·20 per cent. The cupules of several other species were also examined, and the percentages were found to range from 4·55 to 5·27 in Quercus rubra to 12·66 in Quercus coccinea. A photograph of a fruiting branch of Quercus alba was shown.

An exhibition of quite a number of specimens added considerably to the interest of the meeting. Among them were kinos from four species of Eucalyptus and an exudation from Xanthorrhœa Preissii, which were sent by Baron Ferd. von Mueller, of Melbourne, Australia.

The barks of four species of Castanopsis and of two species of Quercus, sent by Mr. H. N. Ridley, of the Botanic Gardens of Singapore, India. Prof. Trimble said, in describing these specimens, that, botanically, Castanopsis is intermediate in character between the chestnut and oak, and that it has only one representative in this country. A fine section of Pareira brava and a specimen

of wood, supposed to be from a species of Quebracho, were presented by Mr. LaWall. A sample of Mexican cacao beans was the gift of Mr. F. M. Tilton, this of city; and a souvenir of the Jury of Awards of the Atlanta Exposition, 1895, was donated by Prof. Trimble.

On motion of Dr. Lowe, a unanimous vote of thanks was tendered Dr. Harshberger for the narration of his trip to Mexico, and to the donors of the specimens.

On motion, the meeting adjourned.

T. S. WIEGAND,
Registrar.

MINUTES OF MEETING OF COLLEGE MEMBERS.

PHILADELPHIA, September 28, 1896.

The stated quarterly meeting was held this day, at 4 o'clock P.M. William J. Jenks presided. Seventeen members were present.

The minutes of the last stated meeting were read and adopted; also the minutes of proceedings of the Board of Trustees for September were read and, on motion, approved.

Prof. Trimble read a report of the delegates of this College to the sessions of the American Pharmaceutical Association, held at Montreal, in August last, in purport as follows: "The meeting was satisfactory in result. Less time was expended in discussing the educational question, and, consequently, more stress given to the numerous papers on scientific and miscellaneous subjects. The social entertainment was highly enjoyed, and the details admirably conducted."

Prof. Remington also referred verbally to the meeting, saying that whilst the subject of coincident education—that is, shop training and technical instruction (college teaching)—was not openly discussed, yet it remains an unsettled question, and there was much significance in the voluntary opinions of leading and prominent pharmacists, as published in the columns of the public journals—notably, the *American Druggist*—a summary of which shows an almost unanimous preference for the practical training of the shop as a preliminary to the theoretical education which the college provides.

Prof. Trimble presented a copy of the Pharmacopœia Mexicana, received from the hands of Dr. Alfonso Herrera, as a contribution to the Library of the College. On motion, the Secretary was instructed to transmit an expression of the thanks of the members to the donor.

Dr. A. W. Miller, Corresponding Secretary, read a communication from Mr. J. H. Maiden, of Sydney, New South Wales, stating that he had succeeded, by appointment, to the office of Government Botanist, *vice* Mr. Charles Moore, F.L.S., who had retired after nearly half a century of service.

The following-named gentlemen were elected Trustees for the three years next ensuing: Prof. Henry Trimble, Geo. M. Beringer and Jos. W. England.

On motion, the meeting adjourned.

WILLIAM B. THOMPSON,
Secretary.

NOTES AND NEWS.

Vermilion is prepared in the wet way by adding lime water to a solution of corrosive sublimate and to the resulting precipitate sodium thiosulphate until solution is effected and the liquid has assumed a yellow color. If it is now heated to 70°–80°, mercuric sulphide separates as a fiery red powder.—*Pharm. Post*, 1896, p. 322.

Examination of Licorice Roots.[1]—The undried samples were received from Ant. C. Denotovich, of Fresno, Cal., who calculated that they would, when dry, show a shrinkage of about 55 per cent. They were grown on the "white ash" land of the San Joaquin Valley, near Fresno. A careful examination gave the following results:

	Per Cent.
Extract in the "green" or fresh roots	22·80
Extract in the air-dried sample	42·22
Total Sugar in the "extract"	17·00
[2] Glycyrrhizin in the "extract"	14·70

Licorice has been grown on a large scale for some time by parties near Stockton, on partly sandy, partly adobe land, also in the Garden of Economic Plants, of the University of California, for ten or more years, and does well. The only question in its culture is the commercial one as to whether it can be profitably grown with our expensive labor, in competition with Europe and Asia Minor. There are millions of acres of soil well adapted to the culture, both in California and Oregon, where a native species, also with a sweet root, grows wild and is a great pest in certain soils. The licorice plant becomes a weed when allowed to escape from cultivation in certain favorable soils. The wild licorice of this country is very largely found on alkali land.

Composition of Goose-fat. J. Rozsenyi. (*Ber. Chem. Inst. Buda Pest*; through *Zeit. ang. Chem.*, 1896, 364.) The following constants were obtained with four samples of goose-fat rendered by the author:

	1.	2.	3.	4.
Specific gravity (15°)	0·9229	0·9258	0·9228	0·9300
Melting point { commenced	26·6°	30·0°	29·5°	29·5°
Melting point { ended	27·5°	31·4°	31·7°	31·0°
Solidification point	18·4°	18·3°	18·1°	18·1°
Melting point, fatty acids { commenced	35·2°	35·3°	39·0°	—
Melting point, fatty acids { ended	36·6°	37·5°	40·2°	—
Iodine number	58·7	62·8	66·4	62·5
Reichert-Meissl number	0·3	0·3	0·3	0·2
Köttstorfer number	193·0	191·2	191·6	193·0
Hehner number	94·5	95·3	95·1	—
Refractive index at 40° (Zeiss)	50·5	50·0	50·5	50·5

—*The Analyst*, Vol. 21, No. 246.

[1] Report of work of the Agricultural Experiment Stations of the University of California for the year 1894-95.

[2] Determined by method given in Vol. II, *Nahrungs- und Genussmittel*, by König, p. 751.